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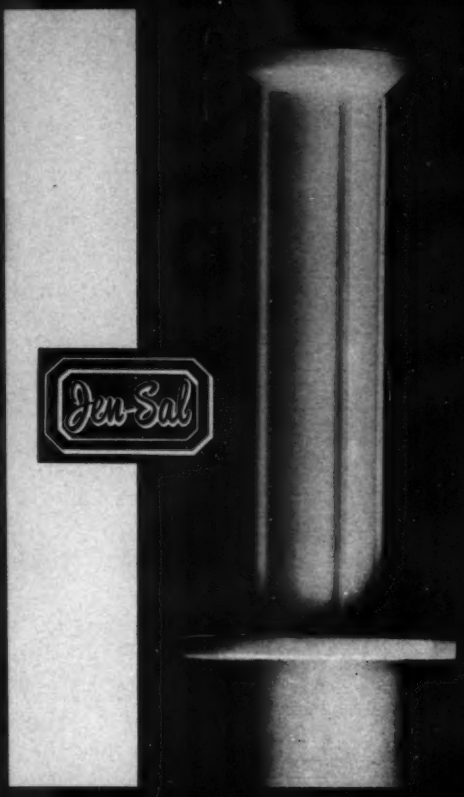

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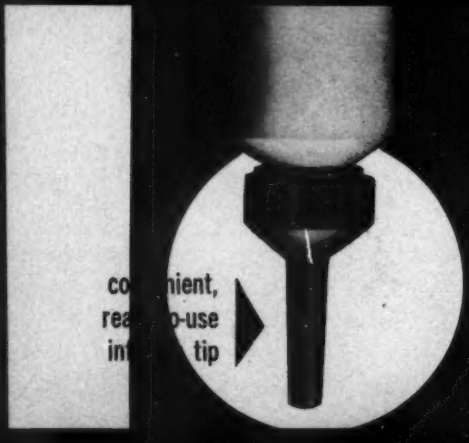

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Vibriosis: Diagnostic And Therapeutic Considerations†

H. L. EASTERBROOKS,* D.V.M., M.S., W. N. PLASTRIDGE,* Ph.D., L. F. WILLIAMS,* M.S., and E. M. KIGGINS,* M.S.

ALTHOUGH its importance was still questioned as late as two years ago, vibriosis now boasts the cosmopolitan reputation of being classified the number one enemy of bovine reproduction.

Vibriosis, a genital disease of cattle, sheep, goats, and possibly human beings is caused by *Vibrio fetus* a Gram-negative, comma shaped, motile bacterium, (fig. 1). Since positive blood serum agglutination titers against *V. fetus* also have been observed by the authors in swine and horses suffering from reproductive disorders, it is likely that they are also among the list of susceptible animals.

Abortion, repeat breeding, and off-cycle returns to estrus are the symptoms most commonly and characteristically associated with the disease. Off-cycle return to estrus may, in reality, be the observable symptom of early, undetected abortion or embryonic mortality which was followed by resorption instead of expulsion. When abortion occurs later than mid-gestation, it is not uncommon for retention of placenta to occur. Recently Van Rensburg[1] reported that abberations of the estrous cycle are common-place in infected herds. We, too, have observed an alarmingly high incidence of anestrus or subestrus, or apparent failure on the part of herd owners to detect heat, in many infected herds. Whether this is another manifestation of the disease or merely coincidental in its occurrence has not been determined.

Fig. 1. Vibrio fetus is a Gram-negative, comma shaped, motile bacterium. (approx. X 1660).

Vibriosis is a veneral disease. Contact transmission also occurs although the exact mode of contact transmission is not yet fully understood. Vibriosis is found frequently in herds making use of natural service, and can be fully as serious a problem in herds bred artificially but which keep a part-time bull. Although it has been found in herds bred exclusively by artificial insemination, such herds usually re-

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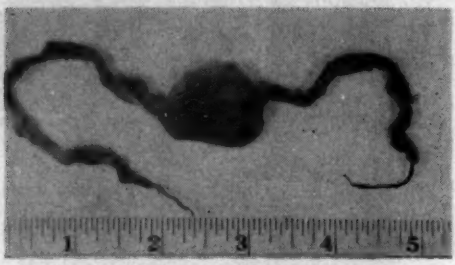
veal a history of purchased replacements or are comparatively new to the artificial insemination clan.

Diagnosis

As in the case of most other bacterial diseases, diagnosis of vibriosis is based on clinical observations combined with the results of cultural or serologic tests.



Figs 2. Fetus and membranes of a 50-day abortion.

Clinical. Many practitioners are making presently a positive diagnosis of vibriosis based primarily on the finding of one or more of the three principal manifestations of the disease. These symptoms, as previously mentioned, are detectable abortion, repeat breeding, and off-cycle returns to estrus. One must bear in mind, however, that a clinical diagnosis of vibriosis, though often correct, can be no more than presumptive. Many other reproductive disorders also manifest one or more of the same symptoms. Clinical diagnosis is increased in accuracy when other diseases can be excluded by known facts, such as knowledge that the herd is brucellosis-free.

Cultural. Laboratory tests are essential to differentiate vibriosis from brucellosis, trichomoniasis, leptospirosis, and other diseases. Since demonstration of the etiologic agent is an accepted criterion for a positive diagnosis, wherever it is possible and practical, attempts should be made to recover the organism by cultural examination.

Routine Practices. Routine bacteriologic examination of material for *V. fetus* should include: Phase contrast microscopy of suitable material, dry mount microscopy of stained films, culturing in thiol (Difco) medium, and culturing on blood agar. The inoculated mediums are incubated for 72 hours or longer in jars in which 5 to 10% of the air is replaced by carbon dioxide.

Aborted Fetuses. Fetuses for examination must be submitted to a laboratory in the quickest possible time. (See figs. 2 and 3). If immediate delivery is not possible, refrigeration, or preferably freezing, and transportation under heavy insulation is essential to secure favorable results. When a practitioner is at the scene and the fetus is so large as to be cumbersome to transport, he may elect either to remove the stomach of the fetus intact after tying off both ends, or to aspirate a quantity of stomach fluid by aseptic means.

V. fetus has been isolated from several organs of the fetus but the stomach fluid is both easy to handle and has most frequently yielded the organism when present. It is important also to submit a blood sample from the dam for serologic testing in the event that the cultural tests are negative or that the fetus is contaminated with saprophytic bacteria. The presence of organisms in the fetus is only secondary resulting from inspiration of infected amniotic fluid.

Genital Tracts. The genital tracts of cows slaughtered for reasons of reproductive failure will, at times, yield *V. fetus.* Mucus from the uterus and cervico-vaginal fold may be examined microscopically for trichomonads, *V. fetus,* and other bacteria. The same materials

Fig. 3. Fetus and membranes of a 90-day abortion.

may be cultured. Mucus collected from the cervico-vaginal area and the uterus may yield positive titers when tested against *V. fetus* antigen even though direct microscopic examination and culturing may fail to detect the presence of the organism. *V. fetus* also may be isolated from the genital tracts of living animals. Aseptically collected swabs, scrapings, or aspirations are taken from the uterus and cervico-vaginal area. Cows and heifers in heat are said to yield the organism more readily than at other times in the estrous cycle.

Bulls. V. fetus has been isolated from the prepuce of bulls as well as from bull semen. Various collection devices such as one described by Bartlett,[2] have been employed in the sampling of the prepuce to secure minimal contamination. When collecting semen for cultural purposes, utmost care should be taken to secure a sample as free from contamination as possible. Since the flora of either the prepuce or semen is so extensive and since *V. fetus* becomes overgrown so rapidly in the presence of other organisms, at its best isolation from the bull is a difficult job. Because of the difficulty encountered in isolating, *V. fetus* from bulls one would not be on safe grounds to call a bull not infected on the basis of cultural findings alone.

Comment. Unfortunately *V. fetus* is by nature a difficult organism to cultivate and loses out rapidly when competing for survival on culture mediums in the presence of other bacteria. Further, there has yet been no satisfactory means reported by which *V. fetus* can be distinguished readily from other Vibrio although this problem is being given much consideration. *Vibrio percolans,* a nonpathogen, has been isolated from bull semen. Recently Thouvenot and Florent[3] have reported the frequent isolation of another nonpathogen, *Vibrio bulbulus* from the semen of bulls and the vaginas of cows which does differ culturally and serologically but is indistinguishable morphologically from *V. fetus.* This finding tends to render direct microscopic examination of little value unless confirmed by cultural and serologic tests. It would seem at this time that, in cattle, the only Vibrio which can safely be called *V. fetus,* before exhaustive confirming tests have been made, is one which has been isolated from an aborted fetus.

Serologic. With the realization that clinical diagnosis is presumptive and cultural diagnosis is difficult to the extent of being not available in some areas, serologic diagnosis may remain as the only tool available to many practitioners by which their diagnosis can be confirmed.

Serology of V. fetus. Difficulty in growing and maintaining *V. fetus* cultures which are specifically agglutinable has made serologic testing a real problem. When cultures are maintained in laboratory mediums for extended periods they tend to become either nonspecific (agglutinable with normal serum) or become inagglutinable (fail to agglutinate with known positive serum.) Failure to recognize these simple facts has led to the appearance of much confusing information in the literature concerning serologic tests. Another finding which tends to increase the problem of accurate serologic testing is a report by Kiggins[4] indicating the existence of two or more specific serologic types of this organism. Laboratories must consider now the use of two antigens or one which will at least react with a high percentage of known positive serums.

Blood Serum. Many unsubstantiated statements may be found concerning the "unreliability" of the blood serum agglutination test for vibriosis. The blood test, when properly employed, is a useful diagnostic tool in detecting cause of abortion and herd sterility. Table 1, previously reported,[5] shows that 62.3% of cows tested, exhibiting clinical evidence of vibriosis in known infected herds were positive to the blood test. The test does fall short in

TABLE 1. Serological Tests on Cows with Clinical Evidence of Vibriosis*

Blood Serum	Cervico-vaginal Mucus	Animals (No.)	Animals (%)
P	P	43	43.9
N	P	17	17.3
P	N	18	18.4
N	N	20	20.4
Total		98	

*Required three or more services; returned in heat; or aborted. P=positive. N=negative.

that it can not be used in a program of eradication or individual cow treatment because of the transient nature of the reaction. Transient reactions are to be expected however, since the disease itself tends to be transient and even self-limiting in a certain percentage of females. The test then is subjected to criticism mainly by those who are unwilling to recognize its value as well as its limitations, and by those who have been unable to produce an antigen which will agglutinate with reasonable specificity. Brucellosis infection or vaccination does not interfere with the practical use of the vibriosis test nor does vibriosis infection interfere with the routine brucellosis blood test[6]. The blood test is, without question, the one test which the practitioner can employ most easily to confirm his diagnosis.

Cervico-Vaginal Mucus. Described first by Szabo,[7] the cervico-vaginal mucus agglutination "tampon" test has received much favor. A tampon, consisting of a rolled gauze pad tied to a long string, is inserted through a speculum into the vagina near the cervix. (fig. 4 and 5.) The tampon is retrieved

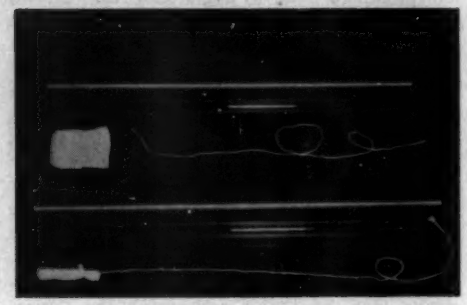


Fig. 4. Components of the tampon. From top: Aluminum rod plunger, 20 in. by ⅜ in., pyrex glass tube, 16 in. long by ¾ in. (outside diameter) having a heavy wall approximately ⅛ in. thick. Ends are flame-polished; gauze is 3 in. by 3 in. (sterilized); string 26 in. long. Note method of rolling and tying gauze sponge for insertion in speculum.

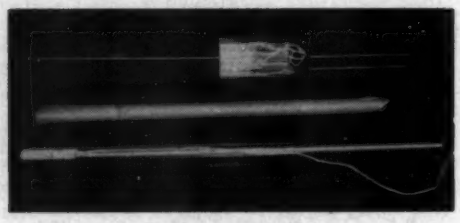


Fig. 5. Packaging of tampons for sterilization and (lower) ready tampon.

in about 30 minutes and placed in a tube containing a formalized buffer solution for transportation to the laboratory where it is to be tested. At the laboratory the tampon is compressed and released repeatedly to remove the mucus and then discarded. (Figs. 7 and 8). The fluid is centrifuged, and the supernatant tested for the presence of *V. fetus* agglutinins in a manner similar to the blood test. This test, although not as easily employed by the practitioner as the blood test, since it does require some special equipment and a little more time, is within the reach of any one who has the desire and a laboratory available. In known-infected herds some animals negative to the blood test have been found positive to the tampon test, and some animals negative to the tampon test have been blood-test positive. In effect the two tests are complementary and may even indicate different stages of the disease or locals of infection. The complementary nature of the two tests is clearly shown in table 1.

Abortion. Since facilities for cultural examination of aborted fetuses may not be available in all states many practitioners must rely upon serologic tests to make or confirm a diagnosis. We would recommend first, the submission of a blood sample, from the animal which aborted, as promptly as possible. This should be tested for evidence of brucellosis, vibriosis, and leptospirosis when facilities for making such tests are available. If the tests are negative a second blood sample accompanied by a cervico-vaginal mucus sample should be submitted within two to three weeks. By this procedure a higher percentage of vibriosis abortions should be detected than by examination of the fetus alone.

Bulls. Securing a positive diagnosis of vibriosis in a bull is even more difficult than in the cow. Besides cultural tests, it also has been suggested that a suspect bull might be caused to serve naturally a group of virgin heifers previously examined and found negative to the tampon test. These heifers would be retested in about four weeks and if positive tampon titers were found in one or more of them the bull would be considered infected. Adler[8,9] has proposed two other methods. By one method semen from suspect bulls is used to breed several virgin heifers artificially midcervix and in three days and weekly thereafter material directly from the uterus is collected and cultured. The main advantage of this method is that a diagnosis may be secured as early as 14 days after receipt of the sample. By the other method, guinea pigs are injected intravaginally and cultured after several days. It is obvious that, with our present knowledge, positive, diagnosis of vibriosis in the bull is a costly, time-consuming task. In infected herds, where a bull is being used naturally it would be both reasonable and wise to consider him infected. Blood test positive bulls should of course be considered infected, however, a negative blood test is no more conclusive than a negative cultural finding.

Attempts which we have made to demonstrate *V. fetus* agglutinins in the mucus of the sheath, collected by the tampon method, have to date been unsuccessful.

Therapy and Control

In a program of practical management, once a positive diagnosis of vibriosis has been secured for the herd, all animals showing clinical evidence of the disease should be considered

infected. Control of vibriosis is a herd problem which requires the employment of all known sound management practices as well as therapy.

Cows and Heifers. Since the disease tends to be self-limiting in a certain percentage of females, the simplest of all treatments is total sexual rest for a period of three months. However, time is usually of importance and intrauterine therapy in problem animals has permitted many herds to retain or at least approach, the much desired 12- to 13-month calving interval even in the presence of infection.

Intrauterine infusions of from 500 mg. to 1 gm. of chloromycetin,[®1] aureomycin,[®4] terramycin,[®5] polyotic,[®3] streptomycin plus penicillin, and streptomycin alone in 20 to 30 ml. of sterile, distilled water, have all been used by the writers with excellent clinical results*. Indications for treatment include: Abortion, off-cycle returns to estrus, and failure to conceive after three services. Medication is administered in a sterile water vehicle using a syringe attached to a standard five millimeter plastic insemination catheter by means of a rubber tube. Other catheters are available but they offer no advantage and are difficult to keep clean and sterile.

Because of its comparatively lower cost and high solubility, streptomycin has been the writers' favored therapeutic agent. None of the other antibiotics or combinations of antibiotics tried were superior to streptomycin alone. In the process of medicating the uterus the last 5 to 10 ml. of the solution used is left in the cervix. When the animal being treated has an enlarged cervix, a 1 gm. streptomycin bougie or a 500 mg. aureomycin or polyotic tablet is placed in the cervix. A streptomycin bougie, aureomycin, or polyotic tablet also is applied in all cases where repeat treatment is required. Another advantage of using streptomycin is that it can be injected at any time during the estrous cycle without producing leukocytosis as occurred with some of the other antibiotics when they were used during the luteal phase of the cycle. Although practitioners are medicating at any time during the cycle, even simultaneously with breeding, we feel that medication at one estrual period and breeding at the next has the added advantage of providing a short rest period. So far as our actual records are concerned, best response followed in those cases treated during the last four days prior to estrum.

Three herds, one badly infected, one moderately infected, and one apparently not infected, were used to evaluate routine uterine therapy irrespective of clinical findings. One half of the cows in each herd were left as controls while the other half were treated intrauterinely with 1 gm. of streptomycin at a nonspecified time during a period of 30 days prior to breeding. The time of treatment was dependent upon the date of routine monthly visits to the herds. In the vibriosis-free herd, there was no difference in conception rates between the treated and untreated groups for one complete breeding cycle. In the moderately-infected herd, treated animals showed a slightly higher conception rate than the untreated controls. One abortion occurred in the treated group while four abortions occurred among the controls. This herd used a part time bull. The heavily infected herd began to use artificial insemination with streptomycin-treated semen at the time the program of intrauterine therapy was started. In this herd, the treated group required on the average, two services less per conception than did the controls. On the next breeding cycle this herd had a normal conception rate. The herd sizes were 40, 50, and 80 mature cows respectively.

Fig. 6. Soap and water, sterile tampons, and rack of stoppered vials containing suitable quantity of buffer solution for collection of vaginal mucus samples.

Bulls. Frank and Bryner[11] have reported the successful treatment of infected bulls with an ointment containing 1 gm. of streptomycin or aureomycin applied directly to the penis. Their

[®1]Parke Davis & Co., Detroit, Mich.
[®2]Lederle Laboratories Division, Pearl River, N. Y.
[®3]Chas. Pfizer & Co., Brooklyn, N. Y.
*The authors take this opportunity to express their appreciation to Parke Davis and Co., Detroit, Mich. for supplying the chloromycetin, Lederle Laboratories Div., American Cyanamide Co., Pearl River, N. Y. for the aureomycin and polyotic, Charles Pfizer and Co., Brooklyn, N. Y. for the terramycin and Merck and Co., Inc., Rahway, N. J. for the streptomycin and penicillin used in these investigations.

results were checked by breeding negative heifers and observing no agglutinin response in the cervico-vaginal mucus. It has been suggested that the artificial vagina might be used as a device for applying antibiotic ointments to the penis. Antibiotic solutions may be used to douche the prepuce particularly for prophylactic purposes. We have attempted treatment with large intramuscular doses of streptomycin (5 gm. daily for seven days) with apparent recovery in half of the cases so treated.

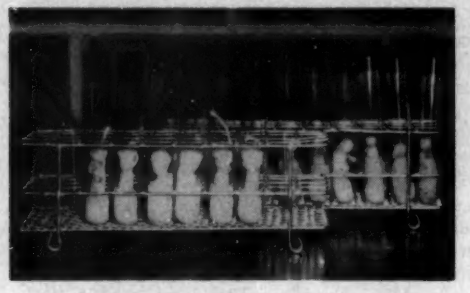


Fig. 7. Collected tampon samples in sterile, stoppered tubes (1" x 6") containing 15 ml. of Sorensen's phosphate buffer solution (pH 7.2) to which 0.3% formalin has been added.

No confirming tests were made and we doubt that this treatment, at least by itself, is practical. It might, however, be combined with local application of antibiotics to the penis and sheath for improved efficiency.

Vaccination. Killed vaccines have proved to be of no value in the prophylactic treatment of vibriosis. The results of three years observations on 100 animals that were given a live *V. fetus* vaccine when six to 12 months of age and that were raised in two infected herds are presently under analysis. All that can be said at this time is that results lend some encouragement to the possibility that an effective vaccine against this disease may be developed eventually.

Artificial Insemination. At the present time it would appear that the use of artificial insemination is the principal usable management factor in controlling vibriosis. In infected herds making exclusive use of artificial insemination in combination with the intrauterine treatment of problem animals, the incidence of infection is being reduced rapidly.

McEntee *et al.*[12] were unable to demonstrate infection in 94 heifers bred artificially with semen that was collected from "infected bulls" when such semen had been treated with streptomycin, penicillin, and sulfanilamide. Our experience with eight heifers that were bred with diluted semen which was treated with streptomycin and artificially infected with *V. fetus* cells, confirms McEntee's findings. Further, Frank and Bryner[11] have stated that: *"Vibrio fetus* has not been isolated from females bred artificially with antibiotic-treated semen from known infected bulls." We have isolated *V. fetus* from aborted fetuses from animals bred artificially with antibiotic-treated semen from bulls of unknown, probably negative, status. There are two plausible explanations: Firstly, that antibiotic treatment of semen was not 100% effective, and secondly, that infection was acquired by direct contact with infected animals. It would not be possible to recommend, with a clear conscience, the use of a known-infected bull, even though semen treatment appears to render it noninfective.

In processing diluted semen, the diluter containing 500 to 1,000 micrograms of streptomycin per ml., should be warmed to between 80 and 90 F. A small quantity of semen (no more than one part to ten parts of diluter) should be added immediately after collection to the warm streptomycin-containing diluter.

Fig. 8. Mucus is extracted from tampons by alternately compressing and releasing the tampon within the buffer solution by use of 8 in. thumb forceps.

The diluted semen should be permitted one hour to cool to room temperature during which period the container should be inverted several times. After one hour it should be placed in the refrigerator to continue cooling and after a total of from four to six hours is ready for use. It is of interest that the Ortho Pharmaceutical Company may soon place on the market a tablet containing penicillin and streptomycin in adequate concentration to treat one vial of Ortho's prepared semen diluter. This will be the first easy method available by which the veterinarian and small herd owner can treat diluted semen.

(Continued on page 68)

Animal Fats In Animal Feeds

R. C. KLUSSENDORF,* D.V.M., Terre Haute, Indiana

ANIMAL feeds now are providing an important market for surplus animal fats. Edible animal fats are important by-products of the meat-packing industry, and help to determine the price paid for livestock brought to market for slaughter. Inedible fats and tallow are equally important by-products of the rendering plants. The income from these fats has enabled rendering plants to provide the dead animal pick-up service which has become an important sanitary factor in reducing the spread of animal diseases.

A surplus of more than 777,000,000 lb. of fat and tallow was reported in 1952,[1] to become a factor in the falling livestock prices. This surplus is increasing year by year as detergents replace soaps, and thereby serve to depress livestock prices.

Great interest has been stimulated, therefore, in developing new uses for animal fats of all kinds. Animal feeds provide an increasing outlet for animal fats because: (1) The oil meals (soybean, cottonseed, linseed) contain ever lower amounts of fat as solvent extraction replaces the expeller process, and (2) the manufactured-feed industry is growing by leaps and bounds and now supplies more than 35,000,000 tons of mixed feeds to animal owners annually.

Mills can and do add animal fats to manufactured feeds for a number of reasons. Some of these reasons are:

1. Utilization of feed is more efficient when animal fat replaces some of the vegetable fat. This fact stands out in almost every comparison reported[2]. Animal fats are rich in energy, are highly digestible, and palatable when fresh, but they provide something in addition to the caloric value. In one typical test, broilers were eating 2.84 lb. of feed to produce 1 lb. of meat, but when 3% of the corn was replaced by 3% of tallow, it required only 2.7 lb. of feed to produce 1 lb. of gain.

2. Palatability of feed is improved when animal fat is added to the mixture. This improved palatability is maintained for the entire storage period if the fat has been treated with a suitable antioxidant to prevent or delay rancidity. Butylated hydroxy anisole (BHA) and diphenyl para phenylene dramine (DPPD) are used widely, but citric acid, propyl gallate, and 2,6, *ditert*-butyl-para-cresol (DBPC) also have been tried.

3. Vitamin A and oxidizable fats are lost less rapidly during storage when the feeds contain animal fats adequately stabilized.

4. Dust is greatly reduced. This fact interests the miller for three distinct reasons: (a) Less feed is lost in milling, (b) wear on machinery is markedly reduced, and (c) the mill workers are more comfortable. Excessive dust is objectionable also to the retailer who stores the feed, to the feeder who handles it on the farm, and to the animal that eats it.

5. Appearance of the feed is improved. It has a better texture and a richer color. When pressed in the hand and released, the feed feels moist and tends to hold its shape. The color is darker and more lustrous, giving an impression of richness.

6. Waste is reduced. A powdery, dusty feed is blown about the mill and lost through ventilation. It is blown away from open feeders. But, more significantly, feed that does not moisten readily in the mouth is wasted before saliva is incorporated with it so that it can be swallowed.

7. Pelleting is easier and faster when the fat content is raised to a normal level. In one mill, the addition of only 1% of animal fat resulted in a fourfold increase in the output of the pelleting machine.

Fat in Cattle Feed

Animal fats are being used in calf starters, and in pellets for beef cattle. They have been tried to a limited extent in feeds for dairy cattle.

For beef cattle on a high roughage ration, adding 5% of tallow to 25 bushels of corn produced the same weight gains in the same time as 50 bushels of corn without tallow[3]. Feed costs were as much less as $1.20. per 100 lb. of gain. Also, rib cuts were found to contain less fat and more lean than from

*Director, Veterinary Medical Services, Commercial Solvents Corporation.

the low-fat rations.

In other tests,[4] the high-fat pellets produced no greater gain and the carcass quality was the same, but economy was in favor of added fats.

No digestive disturbances were observed, but utilization of vitamin A was impaired or reduced, necessitating addition of supplemental amounts.

Fat in Pig Feed

Fat at a level of 8% was fed, along with tankage containing 60% protein at the rate of 4% of the ration of the gestating sow and 10% of the ration of growing-fattening pigs. The fastest-growing pig weighed 201 lb. at four months instead of at the hoped-for six months of age, or the usual seven to eight months to reach this weight. The "quick-growing" pig produced a meat-type carcass which graded Choice No. 1, with a back-fat thickness of 1½ inches.

Fat in Poultry Feed

Feed utilization was improved 5 to 10% in both chickens and turkeys,[5] when fats were added at levels of 2.2 to 5%. However, chickens exhibited no consistent increase in rate of growth nor a shortening of the time to market or maturity. Turkeys showed only a slight improvement.

Adequate mixing is important, and it may be advisable to re-evaluate the protein values. Also, since less total feed is consumed, the rate of including vitamins and minerals may need to be increased somewhat to assure adequate total intake of the marginal items.

Fat in Dog Feed

When the ration of Cocker Spaniels was modified by adding animal fat to raise the total fat from 3.7 to 8%, the results were equal or superior to those achieved in control dogs on a feed containing 29.5% protein[6]. Raising the total fat to 10 and to 12% also produced favorable results.

The puppies grew more rapidly, the bitches milked well, and all animals utilized the feed efficiently. The general conclusion was that animal fat improved the ration by more than could be accounted for in the extra calories. In other words, the feed utilization was improved in dogs as well as in other species.

Future Prospects

The use of animal fats in animal feeds is still in the exploratory stage. However, a few facts and a few trends seem evident.

1. Most rations can be improved by adding animal fat. The improvement is most likely to be expressed as increased efficiency of feed utilization or conversion.

Poultry rations commonly contain 3 to 5% fat, but 11 or 12% is well tolerated, and higher percentages may be, also. Cattle readily eat as much as 1 to 1.75 lb. of animal fat per 1000 lb. of body weight per day,[7] and when this is coated on corn cobs it provides an easy and economical method of feeding. Pilot experiments with rats indicate that much of the energy required by animals may be supplied by fats, and as much as 40% has been fed experimentally. Possibly one third of the energy of a ration may be supplied consistently by animal fats.

2. Adding animal fat often makes the ration a more economical one. On a caloric basis, fat should be 2.25 times as useful as corn. However, because of its high digestibility, animal fat actually is 2.5 to 3 times as valuable. When corn is worth three cents per pound, animal fat is worth eight cents. Possibly the plus value lies in stimulation of the flow of bile and the consequent enhancement of the ability to absorb and utilize other nutrients, such as choline, carotene, and vitamins A, D, and K. Or, it may lie in the thiamine-sparing action.

3. The manufactured feeds provide a logical outlet for much of the surplus animal fat. If 1% of animal fat were added to each of the 35 million tons of manufactured feed, this would utilize 700,000,000 lb. of fat, or almost all of the surplus reported for 1952.

4. Fats with an odd number of carbon atoms are said to give rise to propionic acid, which makes them definitely antiketogenic.

Deterrents

Certain obstacles appear in the path of widespread and rapid adoption of the practice of adding animal fats to animal feeds. Chief among these is lack of familiarity with the fats and their properties, as well as with the physiologic reactions resulting in the animal. Minor factors deal with equipment required and know-how to be gained by millers and feed manufacturers. These apply to such items as storage tanks, antioxidants, heating coils, pumps, pipes, spray nozzles, and mixing apparatus. If the price of animal fats is favorable, the larger mills will buy the necessary equipment and the workers will develop the know-how to use the fats most effectively and economically.

(Continued on page 70)

Infertility Problems In Range Cattle And Their Treatment

RAYMOND HANDER, D.V.M., Windthorst, Texas

DURING the past several years there has been an increased demand for professional service to range cattle to cope with problems of infertility. Probably this has been due to several factors: (1) Increased cattle prices and (2) high cost of feed. Owners and managers are observing the cow herd more closely and watch calf-crop figures. In former years, when a cow did not produce regularly, she was sent to slaughter. Recently veterinarians have been called upon to help determine the cause of infertility in large numbers of these animals. The cost of replacing an adult female represents quite an investment. The drouth of the past few years in the Southwest resulted in depletion of vitamin A essential for normal reproduction. Contrary to past experience highest incidence of infertility is noted among heifers and young cows. Therapeutic agents including sulfonamides, antibiotics, and hormones recommended for treatment of infertility are of doubtful value unless a cause for the condition is disclosed. Correcting faulty management practices may, in themselves, accomplish ends desired.

Artificial Insemination

Artificial insemination perhaps has had as much to do with creating interest in the study of bovine infertility as any one factor. Records are being kept by owners and inseminators on the number of times a cow is inseminated. If the cow fails to conceive, something is done to determine the cause. Furthermore, success in artificial insemination is dependent upon careful observations of the herd. Owners and managers have been impressed with this point and accept it. Through careful records, any abnormalities such as irregular heat periods, silent heat, anestrum, are brought to the herdsman's attention whereas, under the old system of pasture breeding, such records were not available.

Conception rate in cows bred artificially may be lower than those bred by natural service. With good management and well trained individuals performing the work carefully and patiently, results are acceptable. The quieter and easier the cow herd is handled during insemination, the greater the possibility that the conception rate will be high, provided the inseminator uses proper precaution and sterile technic. Technicians doing artificial insemination are taught the dangers of spreading disease from one herd to another by their footwear and other means. These matters are of serious proportions to all personnel handling the cow herd and visitors, including the veterinarian.

The standard procedure that we have followed in our artificial insemination program on the Bridwell Hereford Ranch is, first, checking to ascertain that no infection is present. We like to inseminate the cow after it has been in estrum for several hours. Failure to conceive on the first insemination requires investigation of the heat cycle. If it is irregular, we do not breed at the next estrum but administer approximately 2,000 international units chorionic gonadotropic hormone. In the majority of such cases estrual cycle is regulated. It has been our observation that it is useless to breed a cow with an irregular heat cycle. For those cows failing to conceive after the third insemination, a preparation of 1 gm. streptomycin and 500,000 units of penicillin in 50 cc. sulfamerzine and dextrose is injected into the horns of the uterus. The cow is inseminated 18 to 24 hours later. The possibility of a low-grade infection in the uterus must be considered. Should the cow fail to conceive after the above treatment, a rectal examination is made for any abnormality of the genital organs and, at this time, we inject 2,500 international units of chorionic gonadotropin 15 to 30 minutes before breeding. Some cows have become settled after this treatment.

Nutrition

The provision for a well balanced ration with essential vitamin and mineral mixtures is gaining adherents to assure normal reproduction. Range cows are not subject to the severe strain of milk production so that a lower plane

of nutrition suffices in these animals. Use of vitamin A, in a stable form, has come to the front during recent years in the drought-plagued Southwest. This vitamin is not as necessary for conception as it is to prevent abortion. We hear much about trace minerals such as manganese, cobalt, and copper being essential. Lack of phosphorous, either in the diet or in the soil, may result in anestrum. Some nutritionists are stressing animal protein such as blood meal, meat scraps, et cetera, to supplement plant protein. This appears to have merit under our present range conditions. Heavy fat heifers have more difficulty conceiving than heifers in fair flesh. Ovaries are usually small and may be nonfunctional in the former. Other organs may have become suppressed because of fat and possibly fail to develop normally.

Retained Placenta

For the past several years, we have discontinued manual removal of placenta membranes. Normally, we like to wait at least 48 hours postpartum before any line of treatment is attempted. If the membranes can not be removed easily, we usually insert capsules or tablets containing sulfonamides or antibiotics in the uterus, and inject 25 mg. of stilbestrol and about 3,000,000 units of procaine penicillin. If the cow has not cleaned within 72 hours, we repeat treatment with penicillin. Subsequent breeding is delayed routinely on these animals. We usually like to skip the first heat period before breeding. Examination usually is made at this time and on any evidence of infection, the uterus is infused with 500,000 units penicillin and 1 gm. streptomycin dissolved in 50 cc. sulfamerazine with dextrose.

Other Possible Causes of Sterility

Cystic Ovaries. No attempt should be made to express cysts manually unless their walls rupture easily. Injection of 5,000 units of chorionic gonadotropin intravenously helps correct this condition. Sometimes a second injection may have to be given 10 to 14 days later.

Fibrous Ovaries. This condition usually is found in aged cows, and often small cysts, numbering from one to several, may be found on the ovary. Where one ovary is normal and the other is cystic, the possibility of conception should not be affected.

The Apparently-Normal Cow that Fails to Conceive. This is the most difficult cow to handle; the one that has normal heat periods, normal genital tract on examination, and exhibits no evidence of any abnormality. Treatment of this type cow has produced little results.

Abortions. Isolation of aborters and proper disposition of fetus and membranes should be followed through to prevent possible spread of disease. Blood test for brucellosis should be routine procedure. Vibriosis must also be considered.

Hereford cows such as these are bred by artificial insemination on the Bridwell Ranch in Texas. No supplemental feeding is necessary when range such as pictured is not overgrazed.

Vaccination-Induced Shock Of Anemic Pigs†

I. A. SCHIPPER,* D.V.M., F. M. BOLIN,* D.V.M., and
D. F. EVELETH,* D.V.M., Ph.D., Fargo, North Dakota

PRACTICING veterinarians infrequently have reported anaphylactic-like shock following the injection of hog cholera antiserum into small pigs. This condition was brought to our attention this past vaccination season when losses were observed in healthy-appearing pigs following vaccination with modified live hog cholera virus and hog cholera antiserum.

McBryde[1] has summarized the work of others as well as his own investigation which suggests that anemia is the primary factor predisposing the pigs to vaccination-induced shock. Data presented here confirm McBryde's findings, but do not elucidate on the mechanism of the shock syndrome.

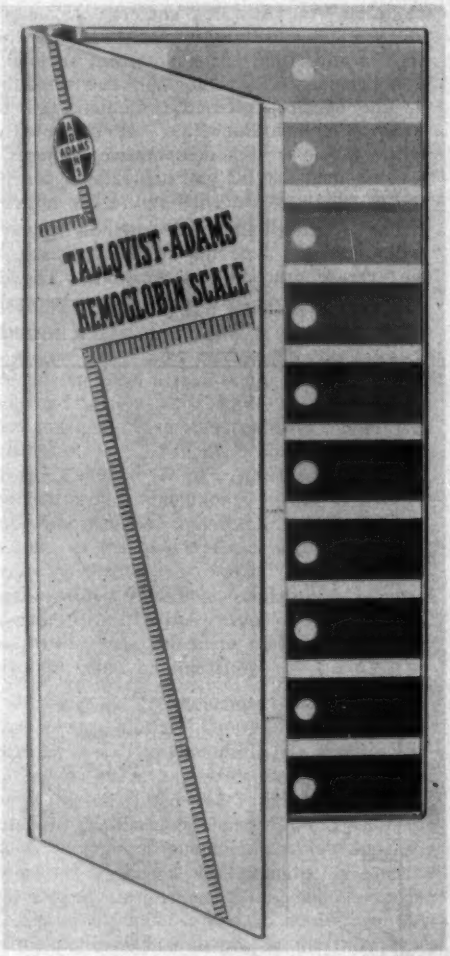
Experimental Procedure

Clinical observations indicated an anemic condition to exist in those animals exhibiting anaphylactoid-like reactions. Blood samples were obtained from all animals to be vaccinated or animals presenting shock following vaccination. Hemoglobin determinations were made by the spectrophotometric method[2]. In some instances, duplicate hemoglobin determinations were made with a Tallquist comparator scale. Weaned pigs were provided with a ration deficient in iron and copper to induce anemia. These served as experimental animals for administration of hog cholera antiserum, attenuated viral vaccine, and erysipelas antiserum.

Results of Investigation

Pigs having a hemoglobin content of 5 gm. or less per 100 ml. of blood presented acute shock upon administration of 15 ml. or more of hog cholera antiserum. The end result in the majority of cases was death. When antihistamine was administered intramuscularly immediately upon detection of shock, the condition was counteracted to the extent that the animal exhibited only depression, polypnea and, in some instances, symptomatology of anaphylactoid-like shock had its onset within one minute following administration of serum.

Pigs having a hemoglobin content of 5 to 7 gm. per 100 ml. of blood presented varying degrees of shock upon administration of 15 ml. or more of antiserum. A more severe



Tallquist-Adams hemoglobin scale, manufactured by Clay-Adams Company, Inc., New York, N. Y.

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Purnell Project 126 — Anemia in Suckling Pigs.

symptomatology was exhibited by those having the lower levels of hemoglobin. The acuteness of shock appeared to be more severe in the animals appearing to be well nourished and having made substantial growth gains. When the hemoglobin content was 7 to 8 gm. per 100 ml. of blood, mild shock symptoms were detected which consisted of polypnea and/or slight depression. In some instances, vomiting was noted.

Animals having hemoglobin concentrations of 5 gm. per 100 ml. of blood exhibited no symptoms of shock upon administration of attenuated hog cholera vaccines or 10-40 ml. of erysipelas antiserum.

The relationship of the hemoglobin level of the blood to shock, following vaccination with modified live virus hog cholera vaccine and the simultaneous injection of 15 ml. of hog cholera antiserum, are summarized in table 1.

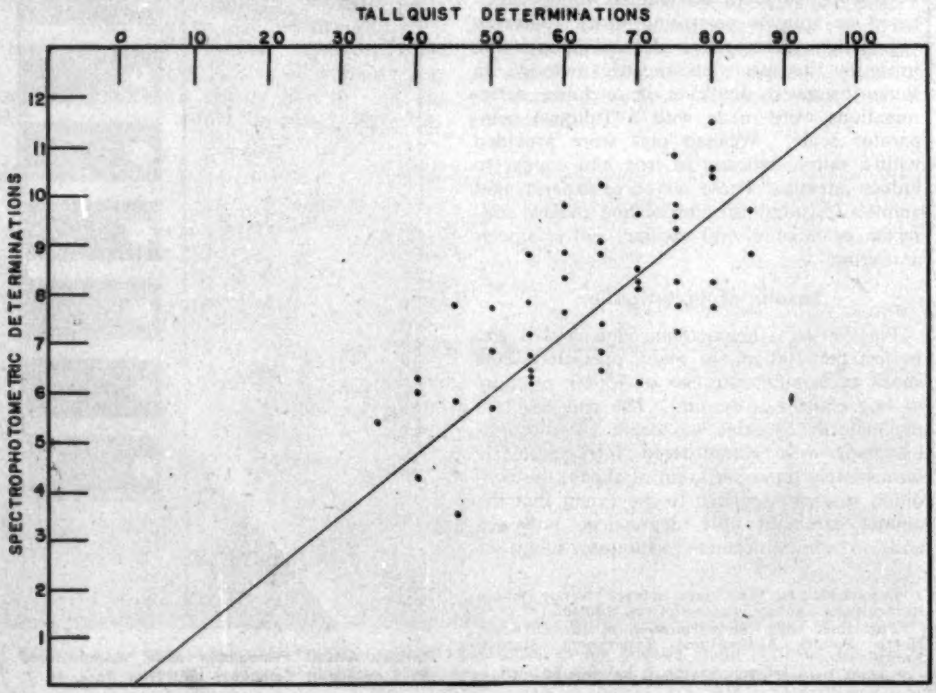
A comparison of hemoglobin determinations by the spectrophotometric method and the Tallquist comparator scale, are presented in figure 1 below. For comparative purposes, it was assumed that 12 gm. hemoglobin per 100 ml. of blood is a normal figure for hogs[3].

The spectrophotometric method involves equipment and time not usually available to the average practicing veterinarian. The determinations made by this method are generally within a minimum of error.

The Tallquist comparator scale method of hemoglobin determination is a rapid one, but often presents wide variations of values. These variations will depend upon the operator and the conditions under which the readings are made. The Tallquist determinations, under most circumstances, should present some indication of presence or absence of anemia, and aid the practitioner in avoiding vaccination of extremely anemic hogs.

TABLE 1. Relation of Hemoglobin Level to Shock Following Vaccination

Gm. Hg. per 100 cc. blood	No. vacc.	No reac.	Mild shock	Acute shock	Death
3-5	24	0	7	9	8
5-7	22	1	2	19	0
7+	93	65	22	6	0



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Pneumonia-Enteritis of the Newborn Calf: II. Pathological Alterations†

T. MOLL,* D.V.M., M.S., PhD., and C. A. BRANDLY,** D.V.M., M.S.

DATA on the pathological alterations of the scours and pneumonia complex among newborn calves are quite limited.

The alterations most commonly observed in cases of calf scours are congestion and edema of the gastrointestinal mucosae and enteritis varying in severity and type from slight catarrhal to hemorrhagic[5,9,20,23,24,25]. Degenerative changes of parenchymatous organs, pneumonia, and thrombosis of intestinal blood vessels also have been reported[5,19,23,24,25].

Both Jensen[11,12] and Christiansen[6] distinguished several types of infectious calf diarrhea, and considered certain pathologic changes as more or less characteristic for each type.

Jensen described two types of alterations in cases of "septic colibacillosis". The constant features of severe, acute cases were hemorrhagic enteritis, erosanguinous peritonitis, splenomegaly, congested and degenerated parenchymatous organs and petechiae of the serous surfaces. In less acute cases the mesenteric lymph nodes were swollen, the hyperemic and hemorrhagic changes usually were absent and the spleen normal. Christiansen pointed out that the pathologic alterations usually were slight in calves killed during the course of the disease, and also in some fatal cases.

Christiansen[7] and Meilboe[15] reported that the most prominent pathologic alterations in "isocolibacillosis", another form of calf diarrhea, were capillary distension, sloughing of the intestinal mucosa, enlarged and moist mesenteric lymph nodes and mild, degenerative changes of the parenchymatous organs.

Jensen[11,12] described "paracolibacillosis" in the newborn calf as characterized by an enteritis varying from slight to hemorrhagic, and accompanied by marked swelling of the mesenteric lymph nodes and spleen, degeneration of parenchymatous organs and, frequently, by a serofibrinous exudation of the serous membranes and the joint surfaces. Christiansen,[6] stated that the most characteristic pathological alterations in paracolibacillosis, as observed in somewhat older calves, were splenic tumor and pneumonia. Lung hyperemia was prominent in early cases, while interstitial edema and cell infiltration, occluded alveoli, and hemorrhagic and fibrinous exudation were more marked in advanced cases.

Sanders[17] found severe gastroenteritis, pulmonary congestion, and a yellow, friable liver in acute stages of enzootic bronchopneumonia in calves. Sholl[18] observed pneumonia in calves one to ten days of age where congestion and cellular infiltration were the prominent changes, and dense areas of mononuclear cell infiltration were evident in some parts of the lungs. Langham *et al*[13] described a bilateral, patchy, bronchopneumonia in calves associated with pleurisy, and inflammatory changes in some of the lung walls, associated with evidence of thrombosis. Baker[3] described bronchitis with thickened, collapsed, adjacent alveoli. In early cases, red, patchy areas of congestion were the main feature, while later cases revealed consolidation.

Thorp *et al*.[12,22,23] concluded that three variations of pathological alterations were present in cases of calf pneumonia. The first was described as an acute, exudative type of pneumonia which progressed rapidly without evidence of proliferative changes; the second was an acute type of pneumonia which appeared to follow a chronic bronchiolitis, manifested by marked, productive, tissue changes in the stroma of the mucosa and, in many instances, in the peribronchial tissue. In the third type, suppuration and necrosis were constant features.

†This paper includes data and a report on work included in a thesis submitted by T. Moll to the Graduate School, University of Wisconsin in 1952 in partial fulfillment of the requirement for the Ph.D. degree. The work reported constitutes a part of project 565 of the Wisconsin Agricultural Experiment Station, the support of which was supplemented by funds from the National Institutes of Health and from the Graduate School, University of Wisconsin. Published with the permission of the Director of Agricultural Experiment Station, University of Wisconsin, Madison, as paper NS 156 of the Department of Veterinary Science.

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Carpenter and Gilman[4] also distinguished three main types of pneumonia in calves. They described an acute, congestive form, a catarrhal form, and a suppurative bronchopneumonia. Pleurisy was a common feature of the two latter types.

Barr *et al.*[3] and Jennings and Glover[10] found degeneration of the parenchymatous organs, catarrhal enteritis, enlarged, edematous, bronchial and mesenteric lymph nodes, and acute congestion and exudation of the turbinates at postmortem examination of calves affected wtih pneumonia. Changes detected in the lungs were acute congestion, extensive diapedesis and some hemorrhage into the alveoli, accompanied by edema and exudation. The interlobular septa at this stage were distended with fluid and there was evidence of thrombosis of some of the pulmonary veins. Following congestion, alveolar walls became thickened and scanty mononuclear and neutrophil cells appeared in the alveoli. The cellular invasion increased in intensity, the alveoli became filled with mononuclear cells and areas of compensatory emphysema appeared around the affected tissue. In the more advanced cases, the picture became one of suppurative bronchopneumonia.

The following presentation is a report on pathological studies of organs and tissues of calves affected with experimentally-produced pneumonia-enteritis (CPE).

Materials and Methods

Calves which died as a result of CPE and calves that were killed at different stages of CPE were necropsied shortly after death[16]. The time which elapsed between death and necropsy did not exceed three to four hours in any case. The organs were subjected to gross examination and tissue specimens were fixed in cold Mossman's fixative for at least 24 hours and stained routinely with hematoxylin-eosin stain for microscopic examination. Thirty-seven affected and four control calves were included in this study.

Acute Pneumonia-Enteritis. Of 22 calves affected with acute CPE, ten died two to five days and 12 were killed two to six days after exposure[16].

The gross pathological alterations observed in these cases were similar in type. All calves revealed poor condition and more or less pronounced evidence of dehydration at the time of necropsy. The peritoneal, as well as the pleural and pericardial cavities, seemed to contain a small to moderate excess of clear fluid. The small intestines were contracted and almost empty in some instances; in other cadavers decreased tonus and considerable fluid content were observed. The mucosa of the small intestines appeared hyperemic in all specimens and sections revealed marked edema of the submucosa and the villi. Relatively few inflammatory cells were present in the villi and the well preserved intestinal lining. Those observed were monocytes.

In cases of somewhat longer standing a number of mononuclear leucocytes were present in the intestinal mucosa, especially in the

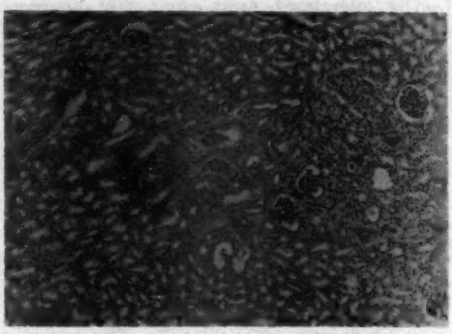

Fig. 1. (50X). Kidney of calf with acute CPE. Killed four days after exposure. Focal nephrosis and interstital mononuclear cell infiltration.

deeper parts. Small areas of epithelial denudation and marked hyperplastic changes of the lymphoid tissue of the intestinal wall also were noticed in such cases.

The mesenteric blood vessels were markedly congested and veins and capillaries in the intestinal wall were distended. Some of the arteries and arterioles revealed signs of damage in the form of hyaline changes in the media, pycnotic or swollen intimal cells and marked perivascular edema. Some vessels were also partly occluded by leucocytes and eosinophilic material. Small scattered hemorrhages were present in the intestinal mucosa of four calves which died of the disease.

In all cases except those of short duration the mesenteric lymph nodes were enlarged, edematous and hyperemic and the spleens firm but not swollen. Hyperplastic changes, as evidenced by large germinal centers and increase in lymphoblastic cell types, were marked in cases of relatively long duration.

The liver generally appeared slightly swollen, greyish-yellow in color, and revealed more or less marked degenerative changes, congestion, and edema. Many small arteries and arterioles in the liver triads revealed the same

signs of damage as observed in the gastrointestinal tract. In cases of somewhat longer duration, there was mononuclear cell infiltration of the portal areas and around the central veins. There were also small foci of mononuclear cells in the lobules.

The kidneys were usually of normal size but revealed a greyish-pink, slightly mottled surface, a very light cortex, and marked congestion of the medulla. Microscopic examination revealed swollen glomeruli with slight increase in number of cells and quantity of eosinophilic material in the glomerular loops. The tubular epithelium was markedly degenerated in some areas of the cortex and focal areas of tubular necrosis were observed in some instances. Hyaline and cellular casts were observed in the lumens of some tubuli, and in some cases there were signs of interstitial infiltration of focal areas in the cortex by mononuclear cells. The result was distortion of normal structures (figure 1). Many small arteries and arterioles appeared damaged with hyalinization of the walls, pycnotic

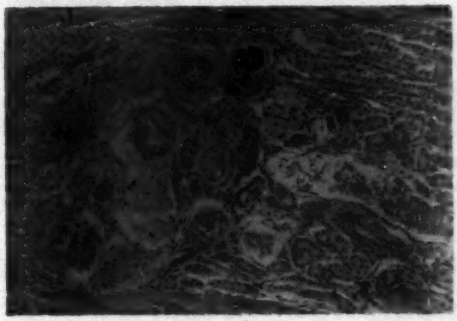

Fig. 2. (120X). Kidney of calf with acute CPE. Killed two days after exposure. Many vessels partly or almost completely occluded.

or swollen intimal cells, and signs of vascular occlusion by white cells and hyaline eosinophilic material (figure 2).

In all calves examined there was more or less marked congestion of the nasal mucosa, and mucus or mucopurulent exudate was observed, especially over the turbinate bones. In cases of short duration, lungs were greyish-pink and the subpleural, interlobar, and interlobular septa appeared edematous. Microscopic examination revealed hyperemia with a marked degree of edema and evidence of cell hyperplasia in the interstitial tissue. The epithelium of the bonchi and bronchioles appeared tall and swollen, with a few mononuclear leucocytes and desquamated epithelial cells in the lumen. Many arterioles and small

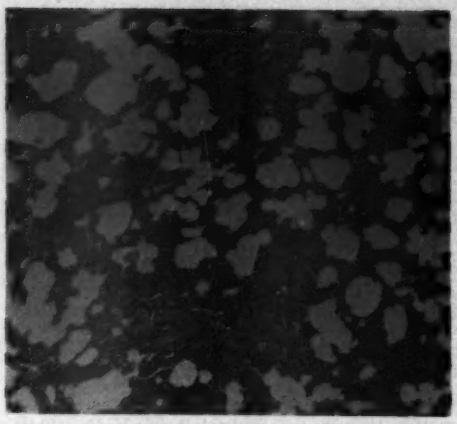

Fig. 3. (50X). Lung of calf with subacute CPE. Marked thickening of alveolar septa with increase in mononuclear cell types.

arteries were greatly thickened and some appeared partly occluded by eosinophilic material and leucocytes. In fatal cases of the peracute form, some small hemorrhages were observed in the lung tissue. In cases of relatively long duration, the lungs were less crepitant and less elastic than those of normal calves. A few small areas of consolidation were observed in the lower lung lobes of two calves which died on the fourth day after exposure. Infiltration by mononuclear cells was considerably more marked in the alveolar septa and the bronchi and bronchioli contained relatively large numbers of mononuclear leucocytes and desquamated epithelial cells.

Subacute Pneumonia-enteritis. Four calves affected with subacute CPE, and killed four to six days after exposure, revealed gross and microscopic, pathological alterations similar to those described for acute cases sacrificed during the same time interval. The lung lesions were extensive and marked in two of these calves which had clinical evidence of pulmonic involvement when killed (figure 3).

One calf, killed on the ninth day, revealed marked hyperplasia of the lymphoid tissue and marked mononuclear cell infiltration of the deep layers of the intestinal mucosa. Scattered greyish-white spots were observed over the kidney surface, ranging in size from pin points to 3 to 4 mm. in diameter. These lesions appeared as irregular spots and streaks confined to the cortical area, and represented extensive and diffuse mononuclear cell infiltrations of the interstitial tissues associated with distorted, destroyed and necrotic tubules, vessels and glomeruli (figure 4).

Fig. 4. (50X). Kidney of calf with subacute CPE. Killed nine days after exposure. Diffuse interstitial infiltration with mononuclear cells.

The lungs were "meaty", dry, and firm without gross signs of bronchopneumonia. Microscopic examination revealed markedly thickened alveolar septa due to extensive and diffuse infiltration by mononuclear leucocytes and young fibroblasts. A few alveoli contained moderate quantities of fibrin and polymorphonuclear leucocytes, indicating a superimposed bronchopneumonia.

Mild Abortive and Inapparent or Subclinical Pneumonia-Enteritis. One calf was killed five days and four calves were killed ten to 18 days after exposure. All four apparently were in healthy condition when sacrificed but had previously revealed relatively slight clinical signs of the disease. Gross examination revealed enlarged mesenteric lymph nodes and spleens, and the lungs were quite firm in those killed ten to 18 days after exposure. Microscopic examination of tissues from the latter group revealed interstitial mononuclear cell infiltrations in all organs, and, in addition, an increase in fibroblastic elements. The kidneys of two of these calves had a few lesions that appeared similar to those described in the animals with the subacute disease which were killed on the ninth day.

Two calves revealed slight clinical signs of CPE during the first days after exposure but apparently recovered completely. One of these calves developed symptoms of uremia and was killed on the 17th day after exposure. Except for the kidneys, the pathological alterations encountered in the various organs were similar to those described in the previous cases. The perirenal tissue was edematous and the pelvic lymph nodes large and pale. The kidneys were approximately of normal size, but the surfaces were speckled by large and small, shiny white, slightly elevated areas. These lesions were confined to the cortex, and consisted of mononuclear leucocytes, young fibrous connective tissue and a few foci of polymorphonuclear leucocytes with complete destruction of all normal kidney architecture within the area involved. The other calf developed severe respiratory symptoms and was killed on the 14th day after exposure. Except for the lungs, the pathological alterations of organs corresponded to those described for the subacute cases killed on the ninth and tenth days. Several rather extensive areas of consolidation were observed in the lower and apical lobes of the lungs, and the diaphragmatic lobes were firm and "meaty". Microscopy revealed rather extensive bronchopneumonia in addition to marked interstitial thickening as a result of mononuclear cell infiltration and an increase in connective tissue.

Two calves were killed 25 and 43 days after exposure, respectively, and when in apparent good health. The mesenteric lymph nodes and spleen were somewhat enlarged and hyperplastic. Microscopy of the apparently-normal lungs revealed somewhat thickened alveolar septa associated with an increase in connective tissue.

Discussion

The data available in the literature on pathological changes of "calf scours" and "calf pneumonia", indicate considerable variability, and an effort has been made to fit the different pathological findings into various etiological disease entities. The variations described, however, seem to be of degree rather than of type. This would be expected and could be explained on the basis of variable severity and duration. The lesions described as "characteristic" of certain infections such as "septic colibacillosis", and "paracolibacillosis" also are said to be lacking in very young animals and in cases of short duration. Such "characteristic" changes may possibly be of a secondary nature.

The pathological alterations observed in CPE and described in this paper also may appear rather variable but there is good correlation between pathological pattern and stage of disease. Gross pathological changes in the early stages may be overlooked easily in many instances but microscopy reveals degeneration, vascular damage, congestion, and edema of the intestines, lungs, kidneys, and liver. Such alterations may well account for dehydration and diarrhea so commonly observed in acute disease. The nature of these early alterations, especially those of the vascular system, somewhat resembles those described by Aptiz[1] and Lewis, *et al.*[14] for the generalized Shwartzman reaction in the rabbit.

Subsequently, mononuclear cell infiltration becomes progressively predominant in the interstitial tissues of the lungs, liver, kidneys and to some extent also of the intestinal mucosa. These lesions may become quite extensive before clinical manifestations and gross pathological changes appear. Such organs or tissues might be less capable of resisting secondary bacterial invaders which may gain access and superimpose upon them other pathological alterations which, in turn, may bring about a fatal issue.

Although the clinical manifestations during the early stages of CPE were predominently gastrointestinal,[16] signs of inflammation of the gastrointestinal tract were absent or slight and some degree of pulmonic involvement was observed at necropsy in all instances. These pulmonic changes became quite extensive and were correlated with marked clinical manifestations in some of the protracted cases[16]. The relatively slow development of the lung alterations may well explain the concept of pneumonia being usually a disease of somewhat older calves.

The pathological alterations observed during the early stages of CPE thus correspond with those of isocolibacillosis, colibacillosis, white scours, and calf dysentery, while the lesions of long standing cases of CPE correspond more closely to those of paracolibacillosis, and calf pneumonia.

The slight differences in pathological alterations encountered in calves dead of the disease and those killed before the terminal stages may be of some significance. Calves allowed to die usually manifested more marked degenerative alterations of the parenchymatous organs, and, in some instances, hemorrhage. These changes are, therefore, most likely terminal in nature.

Conclusions

The pathological alterations of CPE were not confined to any particular organ or organ system but seemed to be of generalized nature. The changes observed in the early, acute stages of the disease were congestion, degeneration, vascular damage, and edema of various organs and tissues including the intestinal wall, lungs, kidneys, liver, spleen, and mesenteric lymph nodes. Subsequently, progressive interstitial, mononuclear cell infiltration was observed in the same organs, most marked in the lung. Signs of interstitial fibrosis and bronchopneumonia were observed in the late stages.

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Vibriosis

(Continued from page 56)

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Lobund Institute

Lobund is an "initial name" for Laboratories of Bacteriology, University of Notre Dame. The fact that germ-free animals are bred and raised at Lobund Institute makes Notre Dame unique in the world of science.

Attempts to rear germ-free animals were made in 1895 but abandoned early because it was found impossible to raise animals on sterilized diets. Animals died of malnutrition. Even at Lobund, with the best of modern technics and knowledge of vitamins, it took years of trial and error to grow white rats.

One of the special projects for study is the problem of tooth decay. Researchers have established a diet which will produce 98% tooth decay in 150 days in ordinary rats confined in wire cages. Germ-free rats on the same diet but sterilized, develop no evidence of tooth decay, suggesting a role of microorganisms under natural conditions.

Births and hatchings take place in sterilized chambers provided with germ-free air. Technicians work through specially constructed openings fitted with rubber gloves. Conceived in 1928 by its present director, Dr. James A. Reyniers, Lobund has made significant contributions to science but is still only started on a 50-year program of basic research in nutrition, radiation sickness, amebic dysentery, shock, cancer, and other important matters.

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Bloat in Cattle

Progress has been made in understanding the causes for bloat in cattle. Dr. R. E. Nichols of the Wisconsin station has simplified understanding by the theory of mechanical interference with escape of gas. This has much to commend it. Experiments conducted by the Wisconsin researcher give some indication that bloat can be controlled by feeding a salt mixture containing small amounts of detergents. Some problems developed during these studies need to be resolved.

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In the opinion of Professor A. Fluekiger, director of the Federal Veterinary Office, Berne, Switzerland, the principal reservoirs of foot-and-mouth disease are animals which have recovered from the disease. He claims that the slaughter programs carried out in the United States and elsewhere have been of value primarily because such procedure resulted in elimination of carriers.

Sensitivity Discs: Their Application to Veterinary Medicine

PAULA BIRD†, A.B., DAN STRICKLAND†, D.V.M. and BERT W. BIERER†, V.M.D., Columbia, South Carolina

Within recent years small, sterile, paper discs containing known amounts of various antibiotics and sulfonamides have been perfected by biological scientists. The paper discs are available commercially and are being used to determine accurately the degree of sensitivity to antibiotics and sulfonamides of pathogenic bacteria which have been isolated from specimens in pure culture. Sensitivity discs are used routinely in human medicine, in hospitals, and diagnositic laboratories and have replaced more cumbersome apparatus.

The above illustration shows the inhibition of a field strain of Salmonella gallinarum by antibiotic discs numbered 3, 4, 5, 6, and 7, which contain polymyxin, chloromycetin,® bacitracin, aueromycin,® and terramycin,® respectively. Discs numbered 1 and 2 show no inhibition. The latter two discs contain streptomycin and penicillin, respectively. The zones of inhibition presented around discs numbered 5, 6, and 7 do not show well in the photograph.

Ordinary plates of culture media are used in conducting the tests. The selection of appropriate media is an important factor. The ingredients of some culture media tend to inhibit the sensitivity of certain antibiotics. It has been found that heart infusion agar is well suited for sensitivity work and that Mueller Hinton medium is well suited for sensitivity work with either sulfonamides or antibiotics.

For the determination of the sensitivity of organisms to various antibiotics, the entire plate may be inoculated heavily with a sterile swab. The discs are then placed on the inoculated culture medium approximately 3 to 4 cm. apart, by sterile technic. Plates are incubated in ordinary bacteriological incubators and examined for zones of inhibition after 12 hours or longer.

In the case of sulfonamide sensitivity determination, it has been found that certain bacteria may synthesize sulfonamide antagonists and thus interfere with the test results. This undesirable effect has been overcome by diluting the microorganism under consideration. One drop of a vigorously growing broth culture is diluted in 100 cc. of sterile saline. One drop of the diluted culture then is spread over the surface of the plate medium. The sensitivity discs are placed directly on the inoculated medium and the remainder of the technic and procedure is as with the antibiotic sensitivity discs.

Discs which inhibit the growth of the culture will present a zone of inhibition. Since some therapeutic agents diffuse more readily than others, the presence or absence of a zone of inhibition, and not the size of the zone, is the indicator of the presence or absence of sensitivity.

Conclusions

Sensitivity discs have a wide application in the field of veterinary medicine and are a valuable aid to the clinician. By this means an effective treatment sometimes can be determined rapidly and efficiently and strains of organisms which have developed resistence to certain antibiotics and sulfonamides can be detected.

Sensitivity discs supply an accurate means of selecting an effective treatment for bacterial diseases and conditions which have not responded to routine handling, provided, of course, that the causative agent can be isolated in the laboratory. A means is hereby supplied for more effective handling of individual cases of bovine mastitis or any other bacterial infection benefited by the use of antibiotics or sulfonamides.

The use of sensitivity discs provides a quick, accurate means of providing information even before the bacteria involved can be identified by routine, time-consuming procedures.

†Clemson Animal Disease Diagnostic Laboratory.

Any laboratory set up to isolate microorganisms can use this technic. In conclusion, it can be summarized that more effective treatment and the saving of the time and expense of ineffective treatment and the subsequent detrimental effect on the patient has been accomplished by the use of this relatively new and valuable aid to clinical medicine.

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New Technic for Area Screw-Worm Control

Entomologists are attempting to vanquish screw-worms in a novel manner in the island of Curacao. It is an established fact that the female screw-worm fly mates only once during her lifetime. Normally appearing, male, laboratory-raised screw-worm flies are made sexually sterile by exposure to gamma rays from radioactive cobalt. Then the wild screw-worm population area is saturated with the sterilized males. If this saturation results in a great preponderance of the sterilized males over the normal, present, wild, fertile males then there will be only a comparatively small number of females mating with the normal fertile males. In other words, the females will have mated with the sterilized males. From this latter union there will be no offspring. If this project meets with any favorable results in the research project in the island of Curacao it may later, during winter months, be extended to Florida.

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Intradermal Tests Differentiate Histoplasmosis and Tuberculosis

Histoplasmosis and tuberculosis in man bear a close, clinical resemblance to each other, especially when the pulmonary area is involved. Therefore it is customary in attempts to establish correct diagnosis, especially since histoplasmosis probably is not spread by human contact, to inject histoplasmin intradermally on the volar surface of one arm, and simultaneously intradermally a tuberculo-protein derivative on the other. If it is histoplasmosis there is an area of induration of 5 mm. in diameter 72 hours after the injection of the histoplasmin, though the tuberculin-injected arm remains free from reaction.

Public Health Aspects of Leptospirosis

Veterinarians are giving more and more consideration to public health aspects of leptospirosis, especially since this disease has been diagnosed positively in cattle, swine, dogs, and horses, as well as some common rodents. Man acquires infection by contact with the urine of infected animals, and this may take place in various ways such as swimming or wading in water contaminated with animal urine, contact with infected cattle, swine, and dogs, and from infected, urine-contaminated food. Practitioners often are exposed during attendance on animals in dysuria cases; therefore the advisability of wearing rubber gloves for necessary manipulation. Veterinarians have been recommending for many years rodent control for this and other maladies traceable to rodents. If, on the basis of a clinical examination, infection is suspected in an animal, laboratory aids by bacteriological and serological methods should be sought. The question sometimes is raised about the use of milk derived from a herd in which leptopirosis has made an appearance. The answer seems to be that if the infected member is removed from the milking line, and the milk pasteurized before human consumption, it is free from danger in this respect.

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Fat in Feed

(Continued from page 58)

Summary

Animal feeds provide an important market for animal fats, and probably will provide an even greater market if the surplus continues to increase. The manufactured feeds will lead the way, because special equipment will be needed to insure thorough mixing in the proportions most advantageous for each animal species.

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Experiments On The Treatments Of Canine Skin Lesions Of Mycetogenic Or Unkonwn Etiology

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SUMMER skin diseases in dogs and cats are widespread ailments, particularly during the warm season. Etiology is not clear and, in the absence of an established remedy[1,2,4,5,6,7,12] the writers were interested in investigating the effect of a yeast extract recently prepared[3,8]. We were aware, of course, that in experimenting with this type of skin lesion, which might be produced by more than one factor, we could not expect a definite answer to the problem. However, contrary to expectation, reports obtained from veterinary clinics where the product was used were so favorable that it was decided to release information thus far obtained due to the practical interest it might have for practitioners.

Material Used

Material used in tests described was a mixture of a special yeast extract, wetting agent, and preservative.

Yeast extract was prepared by one of us originally from baker's yeast and currently from brewer's yeast. The special process was devised so that the product contained an anti-infectious principle which was found located in the protein fraction and was absent, for the most part, from commercial preparations such as yeast hydrolysate, yeast nucleic acid, and other derivatives of yeast products. Work on isolation and identification of the anti-infectious factor is in progress, and in the meantime these active extracts are designated as malucidin,† the killer of evil. The new product has been investigated against a number of organisms and was found active in the protection of laboratory animals against various bacteria including Gram - positive and Gram - negative species. The activity of extracts was demonstrated in *in vivo* tests. These extracts injected into animals protected them against infections with live organisms.

The potency of malucidin is comparable to that of present antibiotics; however, up to date we have not been able to demonstrate its activity against bacteria *in vitro*.

An important feature of this product is that it has activity against fungi which can be demonstrated *in vivo* and *in vitro*. In contrast, commonly employed antibiotics have no fungicidal properties. Occasionally their use is followed by flare-up fungus infection. The new product protects against fungi and when used together with antibiotics inhibits any stimulation of fungal infections.

Field Reports

Following are cited several reports concerning clinical observations on the treatment

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†In all therapeutic experiments on dogs, malucidin was used in the form of malucidin preparation, *i.e.*, a mixture of specially prepared yeast extract, soap, and merthiolate.

of dogs: Dr. Frederick W. Schutz, Brewster, New York, reports: "Having used malucidin freely on dogs in the treatment of both ringworm infection and non-specific skin disturbances, I find that this product has proved to be effective in the treatment of ringworm and fairly effective in the treatment of skin disturbances of a non-specific nature. A note of special interest to me has been the fact that regardless of the amount of the new agent employed or frequency of its use, there have been absolutely no ill or adverse effects manifested by an animal either internally or externally."

Dr. Russell F. Strassburger, Newton, Connecticut, reports: "We have used the 50% crude malucidin and 40% cocoanut oil soap solution you provided on a number of skin cases. The results, in most instances, have been encouraging. The moist, acute, edematous type of dermatitis has responded well to daily applications and we have been able to relieve some of the old, chronic, non-specific types of cases in some instances. We have tried the solution in a limited way on a few mange cases, with no results. It appears that better results are obtained with its use in the hospital than when the lotion was dispensed."

Dr. George Meyer, East Greenwich, Rhode Island, stated that positive results were obtained with the new remedy against furunculosis of staphylococcus and mixed infections. Malucidin was efficacious particularly in the treatment of moist eczema which healed after two or three applications. Malucidin proved efficient also in the treatment of interdigital cysts.

At the Whitney Veterinary Clinic malucidin, in soap solution, has been used in the treatment of many canine skin diseases. Over 200 dogs have been treated successfully. Many of these were coated with the solution day after day for over a week. In general, the treatment was well tolerated and results were more beneficial than with any skin remedy we have ever used.

Some dogs were treated for a month to test cumulative action but no harmful effects were observed. Following are a few observations:

Possibly the most dramatic recoveries were from so-called eczema. Large, wet, inflamed areas on dozens of dogs responded in a matter of hours, and the cases appeared to be completely resolved within a few days.

A Dane was presented with areas of excessive hair loss extending from the shoulders to the tail. Hair fell out in small patches. The dog was to be shown in three weeks. The disease condition was arrested after three daily treatments. New hair appeared in two weeks and the dog won its class in the show. A few weeks afterward he won best-of-breed in another show.

A Dachshund was presented with multiple digital cysts and infections behind the pads on all four feet. The dog's feet were wrapped in bandages saturated with malucidin. Bandages were removed after three days at which time almost all cysts were discharging. On exerting pressure, six cysts yielded small tufts of hair that were removed. Treatment was repeated. Dramatic improvement was observed one day after bandages were removed.

In both cats and dogs, a number of cases of lesions which appeared to be ringworm were treated successfully. Diagnosis was substantiated by admission of human ringworm infection in the owner's family.

Malucidin has proved effective against several forms of cat skin diseases. One highly infectious type which forms tiny pustules, which dry into scabs, responded promptly. Malucidin in soap applications resulted in no harmful effect even though, in some cases, cats licked the treated coat. We found that cats which licked themselves soon found their mouths full of lather, which discouraged licking.

In the cases of several Springer Spaniels temporary reddening of the skin was noted within a few hours of each application. This soon disappeared. In a few others, there was transitory reddening of the skin, particularly in the more sensitive areas of the body.

In the early stages of the use of malucidin, due to limited supply of the product, only small quantities were dispensed to clients. Under those conditions response was not as favorable as in those treated at the hospital. In order to insure good results it was found that this new therapeutic agent should be spread over the skin and allowed to cover the area before rubbing thoroughly to insure penetration.

Experiments described in the following demonstrated the protective action of malucidin against *Candida albicans* infection in mice.

In vivo Activity of Malucidin Y 20 Against Candida albicans

Experiment 1. Malucidin Y, lot 20, revealed antifungal activity *in vivo* as demonstrated by a substantial degree of protection to lethal infections with *C. albicans* which were induced in mice by the indirect methods described below:

Methods and Data. Carworth Farms CFW

female mice weighing 20-24 gm. were used as test animals. Therapy consisted of a single dose of 0.05 or 0.1 ml. of malucidin, made up to 0.5 ml. volume in saline, injected by the intraperitoneal route 24 or 48 hours before infection with *C. albicans*.

Infection. As shown by Brown[9] and Seligmann[10,11] sublethal doses of *C. albicans* may induce rapidly lethal infections in mice when mixed with high doses of aureomycin[®1] or terramycin [®2] or when the antibiotic is injected a few hours before the culture, provided both culture and antibiotic are given by the intraperitoneal route. Our cultures of *C. albicans*, strain 200, were grown on brain heart infusion agar slants at 37 C. for 24 hours and harvested with saline. The final suspension contained about 100,000,000 cells of this mold per 0.5 ml. used for infective inoculum. Five hours before infection the mice were pretreated by the same route with a 2 mg. dose of aureomycin (100 mg./kg.).

single intraperitoneal dose of 0.25 ml. injected 48 hours before infection protected 70% of the mice against lethal infection. Lot 24-S, a clear solution from which yeast protein was removed, showed little or no activity under the same test conditions. The lethal Candida infections were induced by indirect methods described below:

Methods and Results. Groups of ten Carworth Farms strain CFW female mice weighing 18-22 gm. were employed. Therapy consisted of a single intraperitoneal dose of 0.05 to 0.25 ml. of malucidin made up to 0.5 ml. volume with physiological saline. The material was injected either 24 or 48 hours before infection.

A solids determination on lot 22 indicated that this material contained 45.8 mg. dry solids per ml. Hence, mouse doses of 0.05 ml. to 0.25 ml. would represent 2.3 to 11.5 mg. per mouse dose, or 115-575 mg./kg.

TABLE 1. Effect of Malucidin on C. Albicans Infection in Mice

Group	Malucidin pretreat 1 dose I.P.	Aureomycin Pretreat 1 dose I.P. 5 hr.	10 mice per group Survivors: Days after infection 1	2	3	4	5	6	7	8	9	10	11	12
A	0	0	10	10	10	10	10	10	10	10	10	10	10	10
B	0.1 ml.-24 hrs.	0	10	10	10	10	10	10	10	10	10	10	10	10
C	0	2 mg.	0	0	0									
D	0.1 ml.-24 hrs.	2 mg.	10	8	8	7	5	5	3	3	3	3	3	3
E	0.1 ml.-48 hrs.	2 mg.	8	5	5	5	5	5	5	5	5	5	5	5
F	0.05 ml.-24 hrs.	2 mg.	8	5	5	5	4	4	4	4	3	3	3	3
G	0.05 ml.-48 hrs.	2 mg.	3	1	1	1	1	1	1	1	1	1	1	1

Every group was infected intraperitoneally with 1.0×10^8 cells *C. albicans*.

One hundred million cells of *C. albicans* alone were sublethal (group A). When given to mice which had been pretreated with 2 mg. of aureomycin by the same intraperitoneal route, all succumbed within 24 hours (group C). Malucidin administered intraperitoneally 24 hours before infection (group B) in the absence of antibiotic did not enhance the infection. Pretreatment with malucidin of aureomycin-enhanced infections (groups D-G) protected many of the animals during the acute phase of infection (up to the fourth day) and even at the end of the 12-day test period 10-50% of the mice had survived and appeared to be in good condition.

In vivo Activity of Malucidin, Lots 22 and 24, Against C. albicans

Experiment 2. We have repeated these tests with two more lots of material (22 and 24). Lot 22 exhibited good antifungal activity; a

Infection. Acutely fatal infections with *C. albicans* were induced (method of Seligmann) by pretreating mice with a single intraperitoneal dose of 2 mg. of auremycin given five hours before infection with Candida cells. Cultures of *C. albicans*, strain 300, were grown on brain heart infusion agar slants for 20 hours and harvested with saline. The final suspension contained about 100,000,000 yeast cells in each 0.5 ml. of inoculum, which was injected intraperitoneally.

One hundred million cells of *C. albicans*, when injected alone, were sublethal (group A). When given to mice which had been pretreated with aureomycin all succumbed within three days (group B-control). Pretreatment with malucidin 22 given 48 or 24 hours before infection gave as high as 70% protection following a single dose of 0.25 ml. (group C). Lot 24-S showed little or no activity. The test was terminated on the 12th day after infection.

®1Lederle Laboratory Division, Pearl River, N. Y.
®2Charles Pfizer and Co., Brooklyn, N. Y.

TABLE 2. Effect of Malucidin on C. albicans Infection in Mice

Group	Malucidin, pretreat. 1 dose I.P.	Aureomycin pretreat 1 dose I.P. 5 hr.	10 mice per group Survivors 12 days after infection
A	0	0	10
B	0 (Controls)	2 mg.	0
C	#22 0.25 ml.-48 hrs.	2 mg.	7
D	#22 0.1 ml.-48 hrs.	2 mg.	3
E	#22 0.05 ml.-48 hrs.	2 mg.	9
F	#22 0.25 ml.-24 hrs.	2 mg.	5
G	#22 0.1 ml.-24 hrs.	2 mg.	4
H	#22 0.05 ml.-24 hrs.	2 mg.	2
J	#24 0.25 ml.-48 hrs.	2 mg.	0
K	#24 0.05 ml.-24 hrs.	2 mg.	0
L	#24 0.25 ml.-24 hrs.	2 mg.	0
M	#24 0.05 ml.-24 hrs.	2 mg.	0

In experiments with mice, yeast extracts or yeast protein was used alone which demonstrated the antifungal activity of these materials. In experiments on the hairy skin of a dog there was added to yeast extracts certain ingredients in order to insure spreading and penetration of the product and prevent its decomposition. For this purpose a spreading agent (soap) and preservative (merthiolate) were added, realizing at the same time that both could enhance the fungicidal activity of the product.

Summary

In this communication there is described antifungal activity of yeast extract and records are cited of clinical tests indicating therapeutic effectiveness on canine skin lesions when applied topically in a mixture of soap and merthiolate.

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Dog Food Sales

The consumption of canned dog food by the nation's 22,500,000 dogs is running along at the annual rate of more than 1,250,000,000 1-lb. units and that of the dry types (meals, pellets, and biscuits) at the rate of 825,000,000 lb., according to information released by the Gaines Dog Food Division of General Foods.

This means that the average American dog consumes 53 lb. of canned dog food and 37 lb. of the dry type during the course of a year, based on 1954 sales.

Sample survey of dog owners indicates that 82% use some commercially prepared foods part of the time, suggesting that American dogs, too, are the best fed in the world.

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Mr. Fred Henderson has been named head of the Prescription Diet Department of the Hill Packing Co., Topeka, Kan. Mr. Henderson succeeds Clarence Black, who retired recently.

Practical Immunization Of Puppies Against Distemper And Hepatitis

E. I. BROOKS, V.M.D., Hatboro, Pennsylvania

AN experimental program,* extending over an 18-month period, was initiated to determine the best practical regimen to be used in immunizing puppies for distemper and/or hepatitis.

Procedures

Cases presented for immunization were placed in three different categories, based on history and clinical evaluation of the condition of the dog. Puppies placed in category I were those, which, in the opinion of the attending veterinarian, had not been exposed to distemper or hepatitis. These were puppies of known history usually whelped on premises free from contact with adult dogs, other than the bitch. These puppies were given one dose of canine distemper vaccine avianized® (2 cc.) and 0.5 cc. per lb. body weight of canine distemper and infectious canine hepatitis antiserum simultaneously, at different injection sites, upon first presentation at the hospital. Cabasso, Stebbins, and Cox[1] reported that active immunity against distemper can be obtained by simultaneous injection of an egg-adapted, modified canine distemper virus and its homologous hyperimmune serum in ferrets. Puppies placed in category II were those of unknown history which might have been exposed previously to distemper or hepatitis or were in poor physical condition. These puppies were given 0.5 cc. per lb. body weight of bivalent antiserum on first presentation. Two weeks later, the procedure followed under category I was instituted, if the puppy was healthy at that time. During the intervening two weeks, dietary and parasitic problems were studied and corrected and general health followed so as to discover, if possible, if the puppy was incubating distemper, hepatitis, or some other infection. This delay in administering vaccine saved the clinician much trouble from possible reactions in puppies with unknown histories and infection. Puppies in category III were those which were to be vaccinated against both distemper and hepatitis. These puppies were given 0.5 cc. per body weight of bivalent antiserum and 2 cc. infectious canine hepatitis vaccine at different sites, on first presentation. Two weeks later, the same injections were repeated and four weeks following first presentation, canine distemper vaccine avianized and bivalent antiserum was administered.

Dr. E. I. Brooks, director, Hatboro Veterinary Hospital illustrating technic employed for vaccinating a puppy.

Case Reports

As a typical example of application of the plan, the following case report is taken from client records: Female Collie, born February 10, 1953, presented on April 18, 1953. The puppy, weighing 9 lb., had been shipped from Carolina seven days previously. Since history was unknown, the puppy was placed in category II and was given 9 cc. of bivalent serum. On April 12, fecal examination was made which was negative for ova. On April 25, (two weeks following first injection) the puppy was given 14 cc. of bivalent serum with 2 cc. of

*The author is indebted to Lederle Laboratories Division, Pearl River, N. Y. for supplying all biologicals for the program and L. M. Skamser, D.V.M., associate director,, Veterinary Professional Service, Lederle Laboratories, for his help and counsel.

®Lederle Laboratories Division, Pearl River, N. Y.

I-H vaccine. On May 8, the procedure was repeated. On May 22, the puppy was given bivalent serum and avianized distemper virus.

As an example of a case category III, the report of a German Shepherd male is quoted. This animal was given 19 cc. of bivalent serum on April 13, 1953 with 2 cc. of I-H vaccine. Treatment was repeated on April 26. On May 11 bivalent serum again was given with 2 cc. of avianized distemper vaccine. This case, being an example of category III, was such that the previous dog in the household had died of infectious hepatitis immediately prior to the acquisition of the puppy which we vaccinated with three injections. Since exposure to hepatitis was involved, there was no doubt that category III was the proper category for the puppy. Another example of category III was an English Setter, male, ten weeks of age when presented on April 6, 1953 with the history that the neighbor's dog had died of hepatitis on April 3 was given 19 cc. of bivalent serum. On April 27, 19 cc. of serum was again injected with 2 cc. of I-H vaccine and 2 cc. of avianized distemper virus simultaneously. On May 8, serum again was given with 2 cc. of I-H vaccine. There was no untoward reaction of any sort.

Time of Vaccination

It has been our observation that the delay in starting injections to obtain permanent immunity in puppies to approximately four months of age has been the greatest factor responsible for so-called breaks. In other words, puppies had become exposed to distemper, hepatitis, or some other infection before vaccination was attempted. Cabasso, Burkhart, and Leaming[3] had reported that canine distemper vaccine avianized could be administered to puppies as young as five weeks of age. Therefore, it was decided to start vaccination as soon as puppies were weaned and assess the results. Accordingly, 25 puppies were vaccinated immediately following weaning, against hepatitis and distemper under category III. All injections were administered before animals reached 11 weeks of age. All owners were advised to report immediately any reaction observed. On follow-up of these puppies, no reactions or reports of distemper or hepatitis were obtained from the owners.

Once the basic worth of this regimen of vaccination had been proved on a small number of patients, we were encouraged to enlarge the scope of our trial. Accordingly, we began applying this procedure of vaccination against distemper and/or hepatitis to all puppies presented for vaccination. Since April 11, 1953, we have vaccinated 480 dogs for distemper and/or hepatitis with canine distemper vaccine avianized and infectious canine hepatitis vaccine. Not one dog has been returned to the hospital exhibiting symptoms of distemper or hepatitis.

TABLE 1. Summary of Vaccination Experience

Age of 1st visit wks.	No. cases rec. serum only	No. cases rec. serum & vaccine* 1st visit	No. cases rec. serum & virus† 1st visit
6	28 (5.8%)	17 (3.5%) (1)	52 (10.8%)
7	14 (2.9%)	28 (5.8%) (2)	62 (12.9%)
8	21 (4.3%)	38 (7.9%) (3)	84 (17.5%)
9	36 (7.5%)	52 (10.8%) (4)	48 (10.0%)

*Infectious canine hepatitis vaccine
†Avianized distemper virus
(1). Four; (2). Two; (3). Four; (4). Four; cases developed abscesses from vaccine at site of injection.
Abscesses developed using the first lot of vaccine — 2780-BR-123. No abscesses developed from later lots of the vaccine.

Discussion

The efficacy of this method of administration of both the serum, the virus, and the vaccine, has been proved basically to our satisfaction. In utilizing in practice other methods of vaccination against distemper and hepatitis, it was not uncommon to have an occasional break. In the past, dogs or puppies were protected against the diseases with serum until they had reached four months of age, at which time vaccination procedures were instituted in order to confer permanent immunity. Under the present plan, animals are immunized permanently by the time they reach three months of age. No further immunization has been given to the cases and no breaks have been noted.

The accompanying table illustrates the age at which immunization was begun and methods of administration of the vaccine, virus, and serum to a representative sample of all cases which have been handled under the plan.

Perhaps the greatest help which this plan furnishes is the fact that a greater degree of protection is afforded the puppy at the time, or at the age, when protection is an important factor. In the past, by trial and error methods, we have attempted to immunize puppies with the product available at our disposal. In many cases, animals did not respond to the vaccines which were given or were not in condition to respond to the vaccines which were given and would break down at a later date with the disease.

We realize that no vaccine or virus therapy

(Continued on page 85)

Some Troublesome Lesions Of The Coxofemoral Joint Amendable By Surgery†

W. O. BRINKER*, D.V.M., M.S., East Lansing, Michigan

MANY traumatic conditions of the coxofemoral joint can be handled quite successfully by everyday surgical procedures. Others are quite troublesome and require a more radical approach to correct the basic lesions present. This paper will deal primarily with the latter group.

Most troublesome conditions of traumatic origin have anatomical structures grossly altered. An open surgical approach, in many cases, is the most logical means of correcting the basic defects. The dorsal approach as described by Brown[1] has been used for the past two years and found to be a practical one which offers good visibility and a minimum of postoperative complications.

Amendable Surgical Lesions

The open approach has been found to be quite helpful as an adjunct in handling some troublesome coxofemoral dislocations, pelvic fractures with coxofemoral dislocation, fractures with gross displacement in region of the acetabulum, and extracapsular fractures of the femoral neck.

From time to time, coxofemoral dislocations are encountered in which replacement can not be accomplished, or if accomplished, the femoral head does not seat properly in the acetabulum, and on other occasions reduction can not be maintained. Following are some of the most common lesions encountered.

In practically all cases of dislocation a portion of the joint capsule is torn, as is the round ligament. When the dislocation has not been reduced promptly the round ligament may grow fast to the soft tissue, dorsal or anterior to the acetabulum. Severing this attachment is essential for reduction. In experimental cases with coxofemoral dislocations the round ligament in most patients attaches in the original position if reduction is maintained.

Occasionally a tag of soft tissue is dragged down into the acetabulum and interferes with proper seating of the femoral head. This can best be corrected by proceeding along the line of an open surgical approach.

Cases having a small portion of the capital

†Presented at the 25th annual meeting Florida State Veterinary Medical Association., St. Petersburg. Oct. 17-19, 1954.

*Head, Department of Small Animal Medicine, Michigan State College.

Photos courtesy Dr. James Archibald, O.V.C., Guelph, Ontario, Canada

Coxofemoral disarticulation of several weeks duration that recurred after reduction by manipulation. At right, view postoperative following curettage of the acetabulum.

femoral epiphysis broken off and the remainder of the head dislocated are not too uncommon. In the majority of these the fractured portion refuses to heal and at present a femoral head prosthesis has given the best clinical results.

If the femoral head is dislocated for a period of time, the soft tissue in the region of the round ligament attachment in the acetabulum may hypertrophy and thus partially or completely fill the cavity. In most cases this can be gouged out by use of a blunt instrument such as the handle of a scalpel, or if more vigorous treatment is required, a curved chisel or reamer may be used.

In several cases tissue all around the acetabulum appears to hypertrophy and cover the cavity so that solid reduction cannot be accomplished. In most cases this can be retracted sufficiently to accomplish reduction.

Tissue ventral to the acetabulum may roll up (spastic contraction of adductors) and act as a fulcrum which interferes with replacement and maintenance of reduction. Rigid fixation usually is indicated and required.

Partial or complete rupture of one, two or all of the gluteal muscles is a common finding in those cases where the proximal end of the femur is freely movable and unstable. Surgical suturing of ruptured structures is indicated and necessary for best results.

Another lesion encountered in some patients which have had a dislocation for a period is that all soft tissue, including the joint capsule and periosteum, has been detached from the bone dorsal to the acetabulum and this tissue in turn has been stretched to accommodate the femoral head in its new position. Reduction usually can be accomplished but is difficult to maintain due to adaptive changes in the involved tissue. By performing an open approach, the joint capsule and muscles may be sutured with an overlap, thus shortening and returning them to approximately the normal position.

Dislocations may be encountered in connection with fractures of the pelvis. The use of traction and manipulation to accomplish reduction may be non-productive as the femur and fractured segment move as one. By performing an open approach and then using the scalpel handle as a pry between the head of the femur and acetabulum, along with traction on the leg, reduction can be accomplished. Suturing the separated tissues is usually all that is required to maintain reduction.

Among the most crippling of the various types of pelvic fractures are those involving the acetabulum with gross displacement of the segments and femoral head. Performing an open approach, use of a finger medial to the acetabulum in connection with traction applied to the trochanter major often simplifies the reduction procedure. When the Kirschner apparatus is used to maintain reduction, it is usually advantageous to insert the pins before closure.

In cases where the femoral neck is fractured, reduction and maintenance in good reduction during the application of rigid fixation is a difficult task unless an open approach to the hip is performed. The neck usually is

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Photos courtesy Dr. James Archibald, O.V.C., Guelph, Ontario, Canada

Attempts to reduce luxation of the right femur by manipulation alone failed. Open reduction resulted in uneventful recovery

Some Interesting New Aspects Of Veterinary Public Health†

MARTIN P. HINES,* D.V.M., M.P.H., Raleigh, North Carolina

THE role of the veterinarian in public health has been discussed many times and will not be elaborated here. While most veterinarians have a good understanding of the term "Veterinary Public Health", I want to stress that public health, especially veterinary public health, is dynamic and constantly in a state of flux. We must, therefore, continually appraise our objectives in the face of new problems and situations. It is the purpose of this paper to review briefly a few of the many new interesting aspects of this field as observed in North Carolina.

Stray Dog Control

One of the problems that is of great concern to me is stray dog control as related to the control of rabies. The means and methods of controlling the disease are well known, yet public and official apathy prevents control of this menace to mankind in many areas. Canine vaccination is an important phase of any adequate program, but the control of the stray is just as important. Why, then, has the latter been neglected? It is true that programs involving the control of dogs often are thought to be politically unpopular. It is for this reason that some counties have been reluctant to initiate stray dog control programs; however, once the objectives of such a program are made known to the public, overwhelming support has been forthcoming.

Our objectives in the control of the stray dog are three-fold: (1) Protection of human health, (2) protection of our livestock, and (3) protection of our wildlife.

In the past, support for a rabies control program could be initiated only in the face of a rabies outbreak. An ideal program is one that is a well organized, permanent program which is self-supporting. Our present three-fold plan meets these objectives, because it offers constant protection to our health, livestock, and wildlife. We find that farmers and sportsmen give us their unstinted support. With such support, we have declared war effectively on the stray in North Carolina for the first time since rabies invaded the state during colonial days.

Since 1951, over one-third of our 100 counties have appointed full-time dog wardens. These men now are serving over 50% (2,000,000) of our population. Adequate dog pounds have been constructed in each of these counties.

In brief, the duties of the dog warden are to canvass the county picking up stray, unvaccinated dogs, operation of the dog pound, investigation of human animal bite cases for the local health department, and providing assistance to veterinarians at vaccination clinics. The program is financed by the county dog tax fund. In other words, fees which are paid by the dog owners are used to control problems dog create.

Psittacosis

Numerous cases of human psittacosis have been reported in North Carolina during 1954. In addition to the human cases, virus has been isolated from several parakeet aviaries, necessitating destruction of birds. It now appears that the entire nation is experiencing a tremendous increase in human psittacosis since the U. S. Public Health Service relaxed the ban on interstate shipments of psittacine birds. Once the physician has been alerted to this problem, it is not difficult to uncover clinical cases. Human cases in Tennessee have been traced to birds raised in North Carolina, and health officials in several other states have suspected North Carolina birds as the source of human disease. I am informed that bird breeders have spread the word around to "beware" of Florida and North Carolina birds. The major and most difficult problem at present is to find effective ways of controlling this disease. This problem is complicated by the fact that symptomless carrier may spread the infectious agent. To educate and protect the innocent bird lover

†Presented at the 25th annual meeting, Florida State Veterinary Medical Association, St. Petersburg, Oct. 17-19, 1954.

*Chief, Veterinary Public Health Section, North Carolina State Board of Health.

from the dangers of psittacosis is, of course, our primary objective.

Another potential problem is the possibility that the virus will spread to the domestic poultry industry. Serious economic loss in the turkey industry has been experienced during the past year as well as a high morbidity rate among the employees who dress turkeys in processing plants. What is the chance of this virus, which we have allowed to spread throughout the entire country at an alarming rate, "overflowing" into our domestic birds? Should parakeets be allowed in feed stores and other places where feed contamination is possible? These are questions which should be given serious consideration by the veterinary profession. Apparently federal health and agricultural agencies feel that this is a problem to be resolved by state authorities.

Leptospirosis

Our experience with this disease has occured mainly during the past seven months. Since the North Carolina Public Health Laboratory has begun to examine blood specimens for the physician and veterinarian, there has been a tremendous increase in interest in the leptospiroses. More and more physicians are becoming aware of the disease as an important entity in North Carolina. Once the diagnosis is made, an epidemiological investigation is carried out. Since January 1954, we have examined 168 human sera with 42 positives. Seventy-five cattle bloods have been tested with 53 positive. Several of the dog, mule, and goat specimens tested were also positive.

I shall briefly describe two examples of our experience: An eight-year-old Negro boy was diagnosed by his family physician as having leptospirosis. His titer reached 1:2048 for *Leptospira pomona*. An epidemiological investigation revealed that the patient had had no contact with animals which were suspected of having leptospirosis, although the boy frequently helped his father in digging drainage ditches. An ordinary goat was kept on the tenant farm premises where the boy lived. Rats were prevalent on the premises. Drinking water was obtained from a shallow well which could be contaminated easily with goat urine. The goat was bled and reacted to *L. pomona* (1:2560); later the animal was sacrificed and *L. pomona* isolated.

Another interesting case was that of an eight-year-old boy who frequently had complained of fatigue and cold sensations as early as September 1953. After suffering a sprained ankle early in March, weakness and fatigue became striking. In the course of the month there were three or four frank chills. Whether fever followed these episodes is not known. On April 6, 1954, the patient complained of headache and diarrhea. He was attended by a private physician prior to, and during, his stay in a local hospital. Most striking were the severe nausea, vomiting and high fever. There was no jaundice. The spleen could be felt. Transfer to another hospital in another city took place on April 9, where the patient died on April 12. The significant findings were an icterus index of 50, a NPN of 228 mg.% and the presence of hemorrhages in the skin and mucous membranes. At postmortem, examination of the liver revealed evidence of extreme necrosis which was at first thought to be due to exposure to toxic chemicals. Stained sections of this organ as well as those of the kidneys disclosed innumerable Leptospirae. A blood serum specimen obtained two days before death indicated a titer of 1:1048 for *L. canicola*. According to the family, contact with dogs or other animals was minimal. An outside privy was used by the family, and water which was carried from a well close by was found to be contaminated. The patient's mother was uncertain as to whether her son had walked about the community barefooted. There was no history of immersion in pond or creek water.

A significant statement made by one of the attending pediatricians was that many cases similar to this are not being recognized.

Anthrax

Our recent experience with anthrax as an industrial problem was most unusual. Anthrax is not enzootic in North Carolina, although a few human and animal cases have been diagnosed in past years. In March 1953, a single case was reported in a textile worker. Investigation revealed that a plant which manufactures "hair canvas", a fabric used in the lining of men's and women's suits, recently had moved to North Carolina from Philadelphia. "Hair canvas" is a blend of goat hair, rayon, wool, and cotton. The goat hair was being imported from Iran, China, Pakistan, and other foreign countries. Subsequent investigations revealed this plant to be heavily contaminated with anthrax spores. One survey demonstrated *Bacillus anthracis* in 109 of the 200 samples collected. Theoretically, a person working eight hours a day in this plant would inhale a minimum of 27 clumps of *B. anthracis*. We were interested in protecting the health of the employees and in

preventing the infection from spreading from the plant to nearby farms. A conference was held in Washington, D. C., with federal health and agriculture officials but no concrete action was taken. A state law finally was passed requiring all animal hair suspected of harboring anthrax spores to be sterilized before shipment into North Carolina.

The plant was closed until it could be disinfected thoroughly. Samples taken since disinfection have been negative for anthrax spores. It is our opinion that all imported animal hair should be sterilized before it is allowed in interstate commerce. A truck that hauls infected goat hair into North Carolina one day may be hauling, without prior disinfection, animal feed into another state the following day. The dangers involved are obvious. Animal hair can be sterilized.

Poultry Inspection

It has been stated repeatedly that the veterinary profession has "missed the boat" as far as poultry practice is concerned. There are, of course, many exceptions but largely this statement is true. Within recent months a new consumer demand bearing directly on our attitude toward this field has appeared, namely, the demand that poultry products be inspected for wholesomeness. Some of the large cities on the eastern seaboard already have enacted ordinances requiring this type of inspection.

The leading processors in North Carolina inform me that within two years most poultry will have to be inspected for wholesomeness.

Processors, in order to secure a market for their birds, have requested that the local health department supervise this inspection, which is to be financed by the processor requesting inspection. The local health departments feel they should do everything possible to provide this service. It is difficult to find veterinarians interested in poultry inspection even though the processors are willing to provide compensation above that usually paid for "red meat" inspection. The controversial question as to whether a veterinarian needs to be on the inspection line at all times certainly should be given a great deal of thought and study. It is my personal opinion that this is a waste of professional skill and manpower. I am not suggesting that laymen are qualified to do the entire inspection. It would appear that qualified, trained laymen should be able to sort the abnormal from the normal. A veterinarian then should supervise the inspection program and give final inspection to all poultry carcasses which had been retained by the laymen. Both veterinarians and laymen should be in the employ of the health department. The point I am trying to make is that we must, at this time, either make the decision to give the qualified laymen more responsibility or else forfeit the entire inspection program to them. Organized public health is looking to the veterinary profession for practical advice and guidance.

The poultry business is big business. The veterinarian can be the key person in the development of an inspection program. He will be remunerated adequately for his services. It would indeed be regretable if we missed the boat again.

Educational Responsibilities

The most pleasing and challenging activities of my position as State Public Health Veterinarian is that of presenting lectures on the zoonoses to the medical students at North Carolina's three four-year medical schools. (Bowman Gray, Duke University and University of North Carolina.) The interest and enthusiasm of these students in learning more about the problems of animal diseases and their relation to human medicine is most inspiring. As you know, small animal practitioners have, for many years, consulted with physicians about mutual problems and this cooperation has paved the way toward a greater understanding between the two professions. It is predicted that within the next decade a large number of our medical schools will appoint veterinarians on their faculties. The advantages of this are obvious.

The foregoing is a brief summary of some of the aspects of veterinary public health work with which I have become familar. The credit for progress made in the field of public health is due largely to the veterinarian in private practice. Through his professional skill, community leadership, and understanding of human nature, the speciality of veterinary public health has been able to go forward.

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Safety Test on Chloramphenicol

No hemocytoxic effects were produced by prolonged administration of chloramphenicol to 15 monkeys, according to reports of test appearing in *Proc. Soc. Exp. Bio. and Med.*, 85:295, 1954. The need continues to exist for a suitable method for testing the potential bone marrow-depressing effects of new therapeutic agents.

Safer Surgery for Aged Dogs

MARK STERNFELS, D.V.M.
Mount Vernon, New York

The field of geriatrics in small animal medicine heretofore has not been looked upon as a group classification. The small animal practitioner will realize, in the course of his observations, that his practice is divided into many groups and subdivided within groups. A simple classification may be: Pediatrics, or diseases of the young puppy, diseases of middle age, and those diseases which are oberved in the declining years of life of the animal. The latter may be classed as geriatrics. It is purposed here to consider factors of importance in surgery of the aged dog *i.e.*, animals over ten years of age.

It has been the writer's observations that a great many animals exhibiting mammary tumors fall into this category. Ordinarily no effort is made to determine whether these are benign or malignant, or the degree of malignancy. It is the general practice to remove these unsightly growths surgically. Many, once removed, do not recur. In studying these cases, it is important to take into consideration operative risk. It has been our experience that the effect of senility can be found in the vascular as well as any other systems and parts of the body. We have observed that when animals reach 10 years of age or older there is a certain amount of increased fragility of the blood vessels and that tone quality of blood vessels of such an animal is definitely weakened. Hemorrhage may be directly proportional to degree of blood vessel fragility, suggesting advantages to be gained by advanced preparation of the patient by injection of a suitable hemostat. In our practice a combination of oxalic and malonic acid (koagamin®) is a welcome aid.

Surgery

Observations made in over 185 cases in which koagamin was used is reported herein. Anesthesia was selected after evaluation of the patient's general condition. Most mammary tumors can be "shelled out" by means of blunt dissection, during which time the surgical field is difficult to keep clear because of excessive capillary bleeding due to the fragility of blood vessels. Dosage of koagamin recommended is 0.5 cc. for small dogs (up to 8 lb.), and 1cc. for animals weighing 8 to 25 lb. The writer believes that the recommended dosage is too small and perhaps that unfavorable results may have arisen in the past because of improper or inadequate dose. We carefully weigh each patient preoperatively. For each 10 lb. of animal, we administer 1 cc. of koagamin intravenously. For example, a dog weighing 25 lb. is given 2.5 cc. of the agent intravenously prior to (within minutes) of operating. Excellent and measurable coagulation at the time of surgery is evident in a clearer operative field. Seepage from fragile blood vessels is kept to a minimum. Koagamin does not serve as a panacea to stop all bleeding under all circumstances; nor does it cause coagulation in a manner that, in subsequence, would produce a thrombos in another part of the body. In 85 to 88% of surgical cases among animals of the aged group, it minimizes bleeding providing clamps and ligatures are employed on larger vessels. The busy practitioner will find that koagamin is an important drug for routine use in all surgical procedures, especially in those animals 10 years of age or older.

Pyometra

The potential surgical risk in cases of pyometra depends upon the successful administration of a proper anesthetic, the exactness of procedures both from the standpoint of the pus-filled organ and controlling hemorrhage. Koagamin, as an adjunct to proper ligation and forcep control, has reduced these risks greatly.

We can state safely that with less blood loss shock is less likely to ensue and prognosis is more favorable. By way of reemphasis, the writer is convinced that this hemostatic agent should be used intravenously wherever possible, immediately prior to operative procedures using 1 cc. for each 10 lb. of body weight of the patient. If occasions arise where it can not conveniently be given intravenously, preoperatively, it may be administered intramuscularly in the following dosage: 1 cc. for each 10 lb. of weight (never more than 2 cc. at any one site) one hour preoperatively. No toxic or side reactions have been experienced at any time from the use of this drug whether given intravenously or intramuscularly. No respiratory or circulatory interference and no unfavorable sequelae have been recorded, nor have we observed any prolongation of, or interference with, anesthesia.

®Koagamin supplied by Chatham Pharmaceuticals, Inc., Newark, N. J.

Rabies Immunization with Water-in-Oil Emulsions

GEORGE L. OTT† Ph.D., and
ARTHUR J. YAILLEN, Grafton, Wisconsin

Freund *et al.*,[1,2] following their description of the technic of preparing water-in-oil emulsions, reported the enhancing effect of inactivated rabies vaccine prepared in water-in-oil emulsions as indicated by the formation of neutralizing antibodies in vaccinated guinea pigs. They also noted a similar potentiating effect in the production of complement fixing antibodies. In discussing the significance of neutralizing antibodies with respect to protection against viral infections of the central nervous system, they suggested the use of inactivated water-in-oil emulsions of rabies virus (rabbit origin) for use in the immunization of dogs. Because similar types of emulsions have been shown to be effective antigens against other viral infections of both human and animal origin, such as poliomyelitis, influenza, virus of Carré, infectious canine hepatitis, and others, a series of trials were made to determine the effectiveness of an inactivated rabies virus water-in-oil emulsion vaccine as compared to a modified live virus preparation (chick-embryo origin) when challenged with a virulent fixed virus, following standardized potency tests.

A virulent street virus fixed in rabbits through intracerebral passage* was used as the source of antigen, and designated as IDPH virus. Prepared as a water suspension from the brains of rabbits, removed aseptically following notation of paralytic symptoms, the virus was inactivated with 0.5% formalin. Following inactivation, the antigen suspensions were emulsified in oil following Freund's general procedure. Habel virus (mouse origin) fixed for guinea pigs through successive intracerebral, masseter, and intramuscular (rear leg) passages was used as the challenge virus, having an LD^{50} endpoint of $10^{-4.6}$.

Following the rabies vaccine potency test, as suggested by the Tri-Regional Rabies Meeting**, groups of adult guinea pigs weighing 350-450 gm. were injected with either modified live virus (Flury strain chick-embryo origin) (25 mg. dose) or with inactivated rabies virus (IDPH strain) prepared as water-in-oil emulsions (33 mg. dose, 75 mg. dose, 100 mg. dose). Four weeks postvaccination, vaccinated guinea pigs together with unvaccinated controls of the same age, sex, and weight were challenged with guinea pig fixed Habel mouse virus. Following challenge, the animals were kept under observation for a 30-day period, with paralysis and deaths occurring from the sixth to the 14th days postchallenge.

Three series of trials were made. Table 1 summarizes the results following challenge:

TABLE 1. Results Following Challenge with Fixed Virus

	Number vaccinated	Number survivors	Percent survival
Live modified virus (25 mg.)	24	17	70.8
Inactivated virus vaccine (water-in-oil emulsion)			
(33 mg.)	20	12	60.0
(75 mg.)	20	17	85.0
(100 mg.)	38	33	86.8
Unvaccinated controls	20	6	30.0

From these preliminary studies, it is apparent that the inactivated rabies water-in-oil emulsions produced an active immunity as evidenced by an average survival of 80% against a challenge which produced a 70% mortality in the unvaccinated controls, being equally effective to the immunity produced by modified live virus inoculation.

Because the potentiating effect of water-in-oil emulsions extends over a considerable period following injection, further studies are in progress on the duration of immunity produced and will be reported later.

REFERENCE

1. Freund, *et al.*, *Jour. Immunol.*, 57:179, 1947.

2. Freund, *et al.*, *Proc. Soc. Exp. Biol. and Med.*, 68:609, 1948.

†Fromm Laboratories, Inc., Grafton, Wis.

*Obtained through the courtesy of the Illinois Department of Health, Springfield.

**World Health Organization (WHO). Appendix 1-4, page 25, July 1952.

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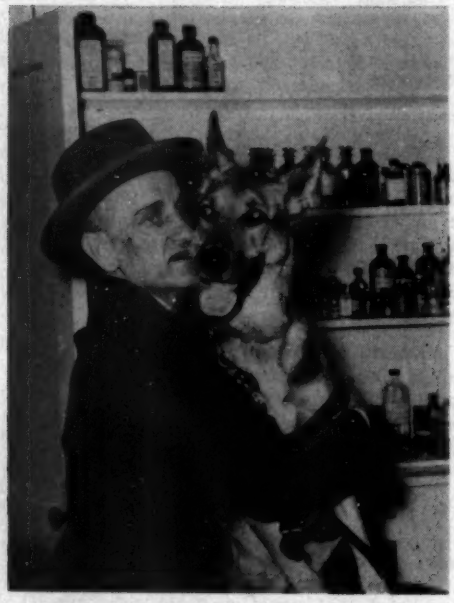
Atropine Sulfate in Poisoning

Veterinarians will recall that, if used early enough, an injection of a therapeutic dose of atropine sulfate is almost a specific in the handling of poisoning following the accidental ingestion of one of the new organophosphorus insecticides. In dogs for example, such clinical symptoms as slow pulse, difficult breathing, trembling, and prostration are alleviated quickly following use of the atropine salt.—*R. R. Dykstra.*

Blindness Due to Retinal Atrophy in a Seeing Eye Dog

W. P. BLAKE†, D.V.M., Columbia, Missouri

On November 11, 1954, a blind man brought his Seeing Eye dog, an eight-year-old, female, German Shepherd, to our clinic for examination. The dog had been in his possession for five years. He felt that his dog was losing her sight. The condition was noticed first about six months previously when the animal appeared to be uncertain after dark. Walk was slower than usual with the nose held close to the ground most of the time. Occasionally a step would be missed or the dog would stumble over objects. It appeared to the owner that the condition was worsening progressively.



After examination with the aid of an opthalmoscope and consultation with an ophthalmologist a diagnosis of retinal atrophy was made. The main findings on examination were: Dilated pupil which responded slowly to light, retinal arteries were difficult to see, while veins appeared prominent, and a pale optic disc. An unfavorable prognosis was made.

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Following examination of the dog, an attempt was made to explain the condition to the owner as to the prognosis, eventual blindness, and the inability to treat the condition satisfactorily. The owner stated that he felt that he understood very well because the reason for his blindness was the same, retinal atrophy.

This case proved interesting in that it brought out the policies of The Seeing Eye organization.

The Seeing Eye is now celebrating its 25th year of operation and has supplied dogs to over 2,000 blind persons. Costs for the blind, if such person fulfills all requirements, including fitness both physically and mentally, is $150. This includes dog, equipment, and tuition. Tuition covers one month's board and lodging of the blind person who must go to Morristown, N. J. for training with the dog. This is only for the first dog. If a second or third dog is needed the tuition is $50. On top of this, if the blind person finds that it would be difficult financially to make the trip, the Seeing Eye will provide transportation. This fee that is charged must be paid in keeping with the blind man's financial resources. It may be as little as $1. per month. Inability to pay has never resulted in the Seeing Eye reclaiming the dog. No local group, service club or the like may take over this obligation. Seeing Eye dogs are furnished to members of the armed forces who lost their sight in line of duty, free of any charge to them or to the government.

There are several groups which provide guide dogs for blind people. There is only one Seeing Eye organization. It is a non-profit organization and relies on contributions from individuals and organizations. It employs no solicitors and does not sponsor or accept funds raised through raffles, benefits, or similar events.

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Huge Loss Due to Disease

In the latest annual report of the Office of Experiment Stations, one station estimates that the annual loss from death of domesticated animals and from lowered production by livestock and poultry may total as high as $2,791,000,000. Newcastle disease in poultry is estimated to cost the industry $40,000,000 a year. It is stated that the livestock and poultry industries yield 56% of farm income. More research is urgently needed to reduce these losses, especially in view of a rapidly growing human population.

Local Hydrocortisone Therapy in Canine Otitis Externa

DAVID M. HOPKINS†, V.M.D., and
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In an effort to gain more rapid and complete healing in cases of canine otitis externa, hydrocortisone acetate ointments were used in 56 cases. Many of these were observed over a period of six months. Cases were classified according to whether acute or chronic, type of debris, and extent of tissue damage.

With the therapeutic basis that a clean auditory canal is essential for its recovery, all cases received considerable attention in the removal of debris. Generally this was accomplished with a dilute solution of therapogen,® gentle irrigation, and the judicious use of cotton applicators tailored as the situation indicated. Ulcerations of the epithelial lining were cauterized with 10% silver nitrate ($AgNO_3$) solution. Hydrocortisone acetate ointment was then applied in a thin film with a cotton applicator, followed by external massage of the ear. In most cases the initial treatment involved the use of 2.5% hydrocortisone acetate ointment with neomycin sulfate*. Cases considered to involve pathogens received the same ointment on repeated treatments. Those responding well received either 2.5% hydrocortisone acetate ointment, or 1% hydrocortisone acetate creme, both being without an antibiotic.

It was found that the second treatment was indicated three to four days after the first, depending on the severity of the case. Subsequent treatments, if needed, were made at five to seven-day intervals. Recovered, obstinate cases were benefited by hydrocortisone acetate ointment used prophylactically, as relapses were common in those that had been severely affected.

Of 56 cases treated, 26 were considered cured. Of these, a few required but one treatment, some needed several. The average required three treatments. Of the others, ten cases showed marked improvement, and six showed no improvement; the remaining 14 being available for examination.

No notable degree of improvement was found in those in which chronic thickening of the site had occurred.

Later work has indicated that a significant percentage of cases of otitis externa gain added benefit from the more complete cleansing of the auditory canal through the employment of enzymatic debridement**.

Summary

The use of hydrocortisone acetate ointments in cases of canine otitis externa has been described and found to be superior to former treatments used in the clinic. Marked, prompt inhibition of the painful, inflammatory process usually occurred with the initial treatment. Results were enhanced when the local application included an antibiotic. Further benefit was observed when preparation of the site included enzymatic debridement.

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Immunization of Puppies

(Continued from page 76)

is perfect, but in the utilization of this plan of vaccination, we confidently have expected and have obtained satisfactory results.

In a summary of any clinical field trial which is conducted without controls only presumptive evidence is available. The majority of animals which were vaccinated under the scheme described in the foregoing have been on adequate diet and sanitation procedures were such that no complicating factors arose. The trial was not run at any kennel. In our experience, private owners are more aware of the well-being of their animals than the kennel owners.

Summary

1. Puppies presented for vaccination against distemper and hepatitis are divided into groups according to factors revealed by history taking.

2. A large group of puppies (480) have been immunized successfully according to the plan described without postvaccinal difficulties.

REFERENCES

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2. Cabasso, V. J., Burkhart, R. L., and Leaming, J. D., *Vet. Med.*, 46:167, 1951.

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The aim in the development of anthelmintics is to produce a drug which will destroy the parasites effectively and that is nontoxic to the host.

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†Clinic veterinarian of the Women's Pennsylvania S.P.C.A., Philadelphia, Pa.

®Theodore Meyer Estate, Philadelphia, Pa.

*Hydrocortisone ointments, Cortef®, and Neocortef®, were supplied by the Upjohn Co., Kalamazoo, Mich.

**Dornavac® supplied by Sharp and Dohme, Inc., West Point, Pa.

Coxofemoral Joint Lesions Amendable by Surgery

(Continued from page 78)

fractured in an oblique direction and rotated downward. Use of a hook is helpful in reducing and maintaining alignment during the application of rigid fixation.

Summary

Various troublesome conditions and surgical hints for their corretcion are discussed. Conditions include; (1) Troublesome coxofemoral dislocations, (2) fractures of the pelvis with dislocation of the femur, (3) fracture with displacement in the region of the acetabulum and, (4) extrascapular fractures of femur.

REFERENCES

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2. Brinker, W. O. and Brown, R. E., Some conditions of the Coxofemoral Joint Amendable to Surgery. Proceedings Book A.V.M.A. 1954.

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Artificial Insemination of a Bitch

Harrop of the Royal Veterinary College in London (*The British Veterinary Journal* for Oct. 1954) reports on Artificial Insemination of a Bitch with Preserved Semen. Dog semen was collected in a canine artificial vagina. The sperm-containing second fraction of the ejaculate was used. Approximately 2 cc. of this fraction was diluted with 14 cc. of pasteurized milk, and later additional carefully heated and cooled pasteurized milk was added to make the final dilution one part of semen to eight parts diluent. After four days of storage at 4 C., the diluted semen was injected into the uterus of a maiden bitch. Conception resulted and two normal puppies were whelped at term.

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Slanetz, in the March 1954 issue of the *American Journal of Public Health*, reported on Use of Antibiotics and Antibiotic Residues in Research Animal Stock Diets. Only three antibiotic residues were studied from which was concluded that no significant difference was apparent in reproduction performance between mice and rats fed diets containing antibiotic supplements and those without benefit of added antibiotic. The same was true of rate of growth in these two species.

"Dog of Mystery"

The memory of Jim, the Missouri Llewellyn Setter, owned by Sam Van Arsdale of Sedalia, Mo., was revived by an article which appeared in *Coronet* for November 1954, captioned as above, by R. DeWitt Miller.

Jim left behind him the unsolved mystery of his eerie faculties. He died peacefully in 1937 at the age of 12 years. His owner became aware of the dog's incredible powers when he was less than four years of age. At that time he surprised his master by recognition of many things and reacted to voice command by placing a paw on a certain species of tree, or a man with a black mustache.

Jim performed amazing feats in the Missouri legislative halls, responding to unrehearsed commands given in several languages and even by Morse code. He is reported also to have picked the winner of seven Kentucky Derbys prior to the annual races. All of these facts and many others are matters of record by sworn affidavits.

It is reported that Mr. Van Arsdale was offered fabulous prices for Jim's public performances. An offer of $325,000. for motion picture rights also was refused. Jim's psychic powers were never exploited and his secret died with him.

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Pseudotuberculosis in Chinchilla

A chinchilla disease known as pseudotuberculosis is a real killer once it gets started. The causative organism is *Pasteurella pseudotuberculosis*. This organism first was observed in guinea pigs that had been inoculated with the discharge of a tuberculosis-like lesion from the arm of a child. Almost all domesticated animals and birds, also man, are susceptible to this infection. Lesions consist in the rather common yellowish-white foci on, and in, the liver. Since similar lesions occur in various bacterial and parasitic infections, it is necessary to isolate the specific organism in order to establish a positive diagnosis. Infected chinchillas naturally acquire the disease through the infection of contaminated food and water. Symptoms are a rough coat, loss of weight, difficult breathing and extreme lethargy. Handling is based on sanitation since sulfonamides and antibiotics have not proved effective. Vaccination is likewise in the experimental stage and researchers are watching with interest results of experimental use of an avirulent *P. pseudotuberculosis* vaccine.

EDITORIAL COMMENTS

Hormones for Livestock Growth and Gain

Use of selected hormones as supplements in cattle feed is invasion in the field of nutrition by another group of products of pharmaceutical manufacture previously classified as strictly therapeutic agents.

Research reports have been published for the past several years on the use of diethylstilbestrol as a stimulant to growth and gain and to provide finish on meat animals. Earlier much was made of the once-called "chemical caponizing" or "tenderizing" by implantation of stilbestrol (a contraction or synonym of the official or generic name of the hormone) pellets in poultry. These, for the most part, have had limited circulation. Many have appeared as brief accounts of basic nutritional research. Use has been progressively greater as larger numbers of venturesome growers and feeders kept pace with research reports of hormone implants and feeding, most of which were favorable.

From implantation to addition of stilbestrol to a premix for daily rations has been the latest step which is commanding the attention of mixed feed suppliers, livestockmen, and commercial producers of this synthetic compound possessing strong, estrogenic properties.

Recently, and at the conclusion of extensive experiments, the Iowa State College Research Foundation patented the use of stilbestrol as a cattle feed supplement. Eli Lilly and Company, Indianapolis, Indiana was licensed to manufacture and sell to feed mills for addition to protein supplement for fattening cattle, a premix containing this synthetic hormone. The new product, named stilbosol,® contains 10 gm. stilbestrol in 10 lb. of premix which is to be added to 1 ton of supplement. When mixed and fed at the rate of 2 lb. per steer per day, the supplement provides the recommended 10 mg. of hormone per head per day.

Farm papers have featured articles containing reviews of experimental results and glowing experience reports. One of these, entitled Hormones for Steers Moves from Research to Feedlot, appears in *Breeder's Gazette* for January 1955. In this the Secretary of Agriculture is quoted, "It is an age of chemistry . . . 25c worth of hormones may put $25. worth of beef on a steer."

In addition to extremely favorable reports with stilbestrol feeding, other investigators, including research scientists at Michigan State College have demonstrated the value of implanting a pellet containing estradiol and progesterone in feeder lambs. An effective new-drug application was filed with the Food and Drug Administration and these pellets were made available by Syntex Animal Products, Division of Foundation Laboratories approximately three months ago. Readers are referred to brief editorial citation to commercial aspects growing out of this research and to the source of the widely distributed article appearing in the farm press (see *Vet. Med.*, December 1954, page 524 and *Farm Journal*, October 2, 1954).

Under normal physiological conditions, estrogenic hormone levels are cyclic rather than continuous. Levels of both estrogens and progesterone are high and continuous during pregnancy. The Michigan scientists believe that progesterone, when administered simultaneously with estradiol, offers a protective influence against undesirable effects of continuous estrogen therapy alone. These are often exaggerated manifestations that have been condemned. An example is the matter of urinary block due to hypertrophy of accessory glands and prolapse observed in feeder lambs implanted with stilbestrol.

Practitioners are being questioned by clients as to the advisability of using hormones on particular lots. Information generally available on which to base confident recommendations is insufficient. Feeders have been made aware of the cautious attitudes of buyers of fat stock. Buyers have, in some instances, discounted market price for animals referred to in the yards as "hopped-up". These men are concerned with cooler shrink and other factors that may affect weight and quality of cuts. They have observed elevated tail heads, nervousness or "bulling" activity, appearance of a dropping of pelvic ligaments, elongated teats in steers, and a peculiarity in moving or getting up from a sternal position.

Veterinarians are interested in information regarding the safety of the drug from the standpoint of both the animal and the consumer of meat derived from its carcass. Assurances have been given as to safety when treatment was applied as directed in the dosage

level recommended. However, little dosage control is possible by feeding hormone-containing supplements. Furthermore, limits of safety have not been established. It is not known how many recommended doses would be necessary to influence ligamentous structures of the animal fed. At the same time, some questions, perhaps remote, remain unanswered concerning the influence of flesh from hormone-treated or fed beef on growth, sexual maturity, nervousness, et cetera, particularly in children. In this a significant public health problem is posed which must be resolved definitely and early since no official control is exercised over the practice of hormone feeding.

The state of Illinois has recognized existence of such problems. Lowell D. Oranger, superintendent of the Division of Foods, Dairies, and Standards, Illinois Department of Agriculture, Chicago, said (December 7, 1954) that the state is not accepting applications for registration of feeds containing stilbestrol, nor will the sales of feeds containing the product be permitted in the state until investigations have been completed. He indicated, however, that such investigations were routine.

It is believed that events to date in regard to hormone use on fattening sheep and cattle mark only the beginning ot a new field for veterinary service. Development of products and extension of their uses seem certain. Practitioners are qualified to advise feeders with reference to designated lots. An understanding of the action of these hormonal substances is necessary for their use intelligently and to assure desired results and profits.

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General Kester Honored

Brigadier General Wayne O. Kester, Assistant for Veterinary Services, Office of the Surgeon General, Headquarters United States Air Force, was designated an Honorary Fellow of the American Board of Veterinary Public Health during the annual meeting of the American Veterinary Medical Association held at Seattle, Washington.

He is the first Air Force officer to receive this distinguished award. General Kester has administered the Veterinary Service since the separate establishment of this service in the Air Force in July 1949 and has 22 years active military service. He graduated from Kansas State College in 1931 and long has been a leader in veterinary public health activities.

Feed Sample Test for Prussic Acid

Veterinarians in much of the drought-plagued Southwest were questioned frequently during the past season with reference to safety of seeded pastures and forage grown under unfavorable weather conditions.

Dr. M. L. Bergsten, Tonkawa, Oklahoma, writing in *The Oklahoma Veterinarian* for December 1954, outlined his method of handling the problem of the client who inquires, "Is it safe to turn my cattle out on my maise (sudan, Johnson grass, millet, cane, et cetera) pasture?" "Is it safe to bale and feed this drought-damaged grass?" Doctor Bergsten was prepared with a plan to give assurances to his client and answered questions posed by saying, "Your feed is probably safe, but if you want to be a little more certain about what you are doing, I will test a feed sample from your field."

Testing feed samples for prussic acid is a valuable service practitioners can render clients. Doctor Bergsten is ready and willing to be of such service. The owner is cautioned with reference to collection and handling samples and is given explicit instructions in procedure. Consideration is given to assure that a representative sample is taken.

Having the test bundle of stalks and leaves available, they are cut into small pieces with sheep shears and dropped into a glass container that can be fitted with a tight lid, taking all precaution that a composite is included for test. Water is added and a tent-shaped piece of paper, to which a prepared test strip is stapled, is placed on top of the mass. Test strips of filter paper are prepared by soaking in a solution of 5 gr. picric acid and 5 gr. sodium bicarbonate in 50 cc. of water, then dried in a darkened room. Prepared strips are stored under refrigeration.

Color changes on the test strips may be observed after 24 hours; deep purple and red are considered dangerous; slight changes, relatively safe; no change, safe. Experience with the test on feed where animals were poisoned makes possible a reasonable degree of accuracy. Variations in color changes suggest the degree of caution to be recommended and a basis for prediction relative to possible poisoning.

Doctor Bergsten has worked out a specific plan for doubtful cases that requires careful observation and trials on one to three head. He emphasized that plants poisonous during one stage in their growth need not always be

condemned. He has observed that in some instances plants lose their poisonous properties when harvest either by grazing or cutting is delayed.

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New Appropriations for Veterinary Research Program at Louisiana State University

Representative Kenneth H. Cagle, Lake Charles, Louisiana, a member of the Commission on Veterinary Education in the South, has reported that the recent session of the Louisiana legislature appropriated $620,000. capital outlay to establish a Veterinary Research Center at Louisiana State University. In addition, $107,250. were appropriated for operating the center in 1955-56. It is understood that these amounts are in addition to the existing budget of the Veterinary Science Department which is $42,000 annually. This means that the 1955-56 operating budget will be $149,250.

This expresses interest in livestock disease problems which have multiplied with the growth of the industry in the South. It also expresses confidence in the solution of these problems by further research activities there.

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The Georgia Veterinary Medical Association appropriated out of fund $300. for the University of Georgia, School of Veterinary Medicine, Athens, which sum is designated for student research, to be conducted under guidance of a faculty committee.

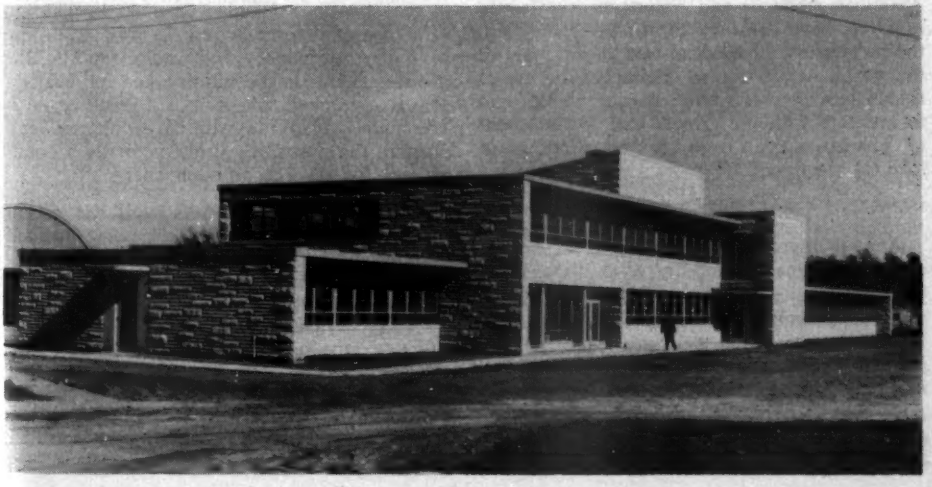
New Clinic and Hospital at Kansas State College

The accompanying photograph below depicts the new and modern veterinary hospital facilities completed on the campus of the Kansas State College, Manhattan. Formal dedication will be held in connection with observance of the 50th anniversary of the School of Veterinary Medicine and will be announced later.

Dean E. E. Leasure said that the new hospital, specifically designed for teaching all phases of clinical medicine, is now ready for occupancy though some finishing work remains to be completed. Constructed of native limestone, as are all permanent buildings on the Kansas State campus, this handsome $575,000. structure presents a modern appearance which is also functional.

Interior arrangement is in two parts; the south portion includes reception room, business and staff offices, examination rooms for both large and small animals, treatment room, autopsy room, surgery, living quarters for student interns, and an auditorium having a seating capacity of 285. Interior walls are of ceramic tile. The north portion is divided into 54 generous stalls, some of which are heated, for large animals. Facilities for loading and unloading are provided, as is ample feed storage space.

The new building will provide the needed area and facilities for handling the large number of cases referred the clinic by Kansas veterinarians throughout the year. Old hospital facilities will be remodeled and occupied by the Departments of Pathology and Physiology.



Generic or Trade Names for Prescription Writing

Use of generic names on prescriptions may be said to be traditional and the American Medical Association's Council on Pharmacy and Chemistry has recommended from time to time their exclusive use in prescription writing.

The American Academy of General Practice, according to Mr. Mac F. Cahal, publisher of *GP*, the Academy's official magazine, was embarrassed by report appearing in *Drug Trade News* that a local chapter had officially endorsed use of generic names of drugs. He pointed out that tradenames have figured significantly in the expansion of the nation's economy and high standard of living, and that any move to discourage their use would tend to curtail industry's contribution to medical progress.

There is quoted in the published notice (*GP*, September 1954) action taken by the Academy's Board of Directors by adopting the following resolution:

"The Board of Directors of the American Academy recognizes that research in pharmacology, development of new drugs, and promotion of new forms of treatment by the ethical pharmaceutical manufacturers of America has been of vast assistance to the medical profession in its traditional endeavors to render the highest quality of medical service at the lowest reasonable cost. The Academy recognizes that the adoption of tradenames and the legal protection thereof is an essential part of the system of free enterprise under which American medicine and American drug manufacturers have achieved the finest quality and the best system of medical care in any part of the world. Any action to discourage the use of tradenames in prescription writing would tend to interfere with the growth and advancement of pharmaceutical research and progress in medical treatment."

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Annual appropriations for venereal disease control and maintenance of V-D dispensaries in New York City were $800,000, during years immediately preceding World War II. No longer are funds made available for this purpose and dispensaries are closed. Considering the impact on the national economy only a few years ago by these age-old diseases, their control may be considered among the greatest accomplishments of medicine.

Regional Veterinary Education Studies in New England

A survey has been completed in Connecticut, and proposed elsewhere in New England, for the purpose of determining availability of certain specialized training for students in the New England states that is not now offered in state-supported schools of these states. Veterinary medicine is included in the group of specialties under study.

The goal of this survey is to determine first what the actual veterinary requirements are, and whether students living in New England have a fair opportunity for training outside the state.

Regional education apparently has solved many problems posed in southeastern states some years ago. There appears to be no valid reason why such a scheme should not have universal application.

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Court Decision on Human Artificial Insemination

In the opinion of Superior Court Judge Gibson E. Gorman, Chicago, heterologous artificial insemination in man is contrary to good morals, constituting adultery on the part of the mother of a child conceived by artificial insemination and illegitimacy of the child. In such decision Judge Gorman trespasses beyond pure judiciary and into the religious field. His statements have been termed "harsh and arbitrary" and even "ridiculous". Affected are thousands of families, not just the one brought to the attention of Judge Gorman in Chicago in a case of divorce action. In this, according to daily newspapers and radio reports, the plaintiff (wife) in the action asked full custody of a five-year-old son born as a result of A. I. The judge ruled the wife an adulteress and directed the husband's attorney to file a counter suit for divorce on such charge.

Prior court ruling differs with the recent Chicago decision. A New York court decided some years ago that a husband, while not contributing to conception, assumes the role of foster or adoptive father and that the child so conceived is not illegitimate.

The problem may be primarily a legal matter. It, nevertheless, has other aspects including religious and medical. The status of a large group of children needs to be clarified by appropriate legislation.

Plan Runnells - Stafseth Day

A committee was appointed recently by Dean Clark of Michigan State College, to recognize, in appropriate fashion, the retirement next July 1, of Dr. Russell A. Runnells, head of the Department of Animal Pathology, and Dr. Henrik J. Stafseth, head of the Department of Bacteriology and Public Health. The Committee plans to publish a memoir, prepare framed portraits for display in Giltner Hall, and to bequeath suitable personal gifts. All expenses will be defrayed by spontaneous contributions from former students, alumni, and friends.

On the afternoon of April 28, 1955, six former students, who have achieved prominence, will present scientific papers to be published in the memoir at ceremonies to be held in Giltner Hall. In the evening a banquet will be held in the College Union. Alumni and friends are invited to attend both activities and receive a copy of the memoirs.

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The Remarkable Story of Antibiotics Development

Ten years ago penicillin cost $20. for 100,000 units. The O.P.A. ceiling was somewhat higher. Today, the same amount is priced at two to eight cents. When first introduced, streptomycin was priced at $15. per gm. Today it can be bought for 15 cents. These astonishing facts are a tribute to ingenuity of American manufacturing enterprise, and a boon to mankind.

Director of press relations of the American Medical Association, John L. Bach stated that, "Antibiotics have not only cancelled out many of the once-fatal diseases, but they have eliminated entirely many of the bread-and-butter diseases which kept physicians so busy years ago." Tremendous quantities of antibiotics are employed by veterinary practitioners in a large number of diseases of domestic animals. These agents, unknown only a few years ago, now are considered indispensable. Profits to industry have been substantial to be sure, but the cumulative and manifold benefits of antibiotics make clear that mankind has profited most from the marvelous development of antibiotic research, production, and therapeutic use.

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The incidence of mucosal disease in cattle has increased during the past year in Illinois. —*P. M. Beamer, D.V.M.*

Lt. Col. Gochenour Decorated for Combat Duty in World War II

Lt. Col. William S. Gochenour, Jr., USA-VC, son of Mr. and Mrs. William S. Gochenour of Indianapolis, Ind., was awarded the Combat Infantryman Badge and the First Oak Leaf Cluster for the Bronze Star Medal for exemplary conduct in ground combat against the enemy in April 1952. Presentation was made by Maj. Gen. George E. Armstrong, Surgeon General of the Army at a ceremony held in his offices on September 23, 1954.

Colonel Gochenour is on duty in the Office of the Surgeon General of the Army in Washington, D. C., as Chief, Liaison, Standards and Animal Branch, Veterinary Division. He participated in ground combat against the Japanese while a member of Troop B, 26th Cavalry (PS) in the Pacific Theater of Operations.

At the time of the attack on Pearl Harbor, Colonel Gochenour was Regimental Veterinarian for the 26th Cavalry (PS) but by January 1, 1942 the cavalry regiment had lost so many animals that its first squadron was dismounted. Later the entire regiment fought as infantry. The need for officer personnel required Colonel Gochenour to take over as a troop officer.

His troop, after initially engaging the enemy at Lingayen Gulf, later covered the withdrawal of the Luzon forces into the Bataan Peninsula. He was subsequently a prisoner of war of the Japanese for almost three years.

Colonel Gochenour was graduated from the University of Pennsylvania School of Veterinary Medicine in 1937 and entered the Army two years later.

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Food Poisoning

Approximately 350 persons of 900 served at a church dinner in Kansas became ill with fever, vomiting, severe diarrhea, and marked prostration shortly after eating. Investigation disclosed that 11 of 25 food handlers who prepared the meal were found to harbor epidemic strain of Salmonella organisms. Of these, two were suspected as the most probable source of infection. All of these persons had been well both before and after the outbreak. One worked as a cook elsewhere for a family whose members had attacks of diarrhea two weeks earlier. —*Morbidity and Mortality Repts., Dec. 3, 1954.*

PRINCIPLES OF ANIMAL HEALTH

R. R. DYKSTRA, D.V.M.
Manhattan, Kansas

Wet vs. Dried Brucella Vaccine

Dried Brucella abortus vaccine (strain 19) is reported approved as the exclusive official vaccine in 15 states, and in an additional six or seven states either this dried vaccine or the liquid suspension may be used. Remaining states record the liquid form as official. There is no difference between the antigenicities of the two vaccines, although the dried form is more stable under adverse conditions. It retains its potency for a longer period, but when liquified is as susceptible as the older, liquid form. Because of greater detail required in its production, the dried form is sold at a slightly higher price than the liquid vaccine.

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Transport Tetany

In a European veterinary journal we recently read an article about the effect of transport, by lorry, on the secretion of milk in cows. It recalled to mind the so-called American "Railroad Disease" (transport tetany) so common during the fall months when cattle are shipped to fairs for exhibition purposes. Affected animals exhibit staggering, muscular spasms, and finally go down. The actual cause of the disease is not known though there is reason to suspect a lack of calcium in the blood, with the presence of ketones suggested by characteristic breath odor of the patient. On this basis, treatment is usually along lines similar to that employed in acetonemia. The prevention consists in removing pastured animals several days before they are to be transported by rail, in closed stuffy cars, to feeding in the dry lot, and during shipment keeping before the animal at all times a supply of fresh water and feed. Avoid excitement as much as possible, and provide comfortable bedding both during and after shipment. Rest and relaxation do much in overcoming the effects of shipment.

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Livestock owners believe that in a case of mild or moderate bloating in cattle (not the fulminant type) a feeding of oat straw will induce eructation of gas, providing automatic relief.

Fescue Foot

The fescue plant (Festuca species) is becoming a valuable forage and pasture crop for cattle and sheep in several sections of the United States, including Oregon, Kentucky, southern Illinois and others. There are several strains of the plant such as tall fescue (*Festuca arundimacea*), meadow fescue (*Festuca elatior*), red fescue (*Festuca rubra*), sheep fescue (*Festuca ovina*), et cetera. Of the foregoing mentioned strains, the tall fescue, and the meadow fescue, are most often planted. After the seed crop has been harvested from tall fescue, this plant makes a new growth that is frequently pastured. Some cattle grazed for some length of time in the fescues may develop symptoms closely resembling ergotism. Pathological changes in distal body parts may even progress to sloughing. All the facts are not known, but when evidence of circulatory interference appears as impending slough or necrosis of parts, and there is no ergot in the material grazed or in the grain ration, and fescue is the exclusive roughage fed or grazed, presumptive evidence is that the fescue is at the bottom of the trouble.

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Rumen Flora Sensitive to Antibiotics

A Swedish research project conducted by Paul Andersson has determined that aureomycin® in doeses of 1 to 6 gm. administered to sheep and goats over two to four days resulted in complete loss of appetite, at least following larger doses. In these cases no fungi or infusoria could be demonstrated microscopically in rumen contents. However, when supplied with rumen contents derived from controls, recovery occurred rapidly. Even with smaller doses administered over longer periods, rumen function was impaired, although the animals gradually became accustomed to the antibiotic so that appetite returned to normal. The experiment indicates that rumen flora is exceedingly sensitive to aureomycin, and frequently will have to be given later to restore funtion.

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® Lederle Laboratories Division, Pearl River, N. Y.

VETERINARY PARASITOLOGY

A. O. FOSTER, B.A., M.A., Sc.D.

Beltsville, Maryland

The Practical Aspect of Low-Level Phenothiazine for Cattle

Current reports on the potentially broad spectrum of antiparasitic actions achieved by the prophylactic administration of phenothiazine to cattle,[6,10,14,17,20] as well as reaffirmations of the therapeutic efficacy of this drug[2,5,16,21] are in contrast to experiences which only recently seemed, in effect, to discredit the use of phenothiazine as an antiparasitic agent for these animals[1,3,4,18].

Present concern centers chiefly upon methods of low-level and free-choice administration, largely because there has been a rebirth of enthusiastic interest since the announcement that these measures may be beneficial in reducing the intensity and incidence of warble infestation[20]. In passing, it is desirable that note be taken of the fact that the authors regarded their findings as "only indicative and not conclusive". It is pertinent, moreover, to recall that a daily intake of 1 gm. of phenothiazine per cwt. has been shown to prevent the development of horn fly larvae in the feces of treated cattle[8,9,18]. It is also pertinent that the free-choice regimen has been suggested as probably the best measure presently at hand to combat the injuriousness of lungworms[7,21]. Significantly, these and other[13,14] currently discussed aspects of preventive medication represent only the potentially broadened spectrum of a measure which, if feasible, has been regarded many years as a promising means of controlling injurious species of gastrointestinal nematodes[8,12,15].

Now, more than heretofore, veterinarians are confronted with the imperativeness of a sound professional position regarding the so-called free-choice and low-level methods of administering phenothiazine to cattle. In its research aspects, the problem can not be regarded as adequately solved, for reasons outlined previously on this page,[12] especially from the standpoint of professional application. It already is established that no specific free-choice formulation is likely to be universally applicable and that none is equally effective for all animals in a specific herd[12,19]. Nevertheless, it has been established that an intake by calves of 0.5 gm. of phenothiazine per cwt. per head per day, with a maximum daily intake of 2 to 5 gm. per head by animals over 400 lb., is definitely beneficial from the standpoint of controlling large stomach worms, hookworms, and nodular worms, and that this dosage affords some control also of other injurious bovine parasites. This dosage, moreover, is without deleterious effects on the host animals, so far as has been determined; at least, no suggestion of symptoms from this dosage, unless in milk cows, has appeared since the work of Bruce[6] in 1940. It also has been emphasized in recent studies that beef animals, even though exposed to only moderate degrees of internal parasitism, are significantly benefited by low-level phenothiazine[6,9,15]. This measure has been used on innumerable herds with wholly beneficial results as far as reported provided there was adequate and uniform consumption of the drug. Finally, as is well known, free-choice medication has worked well in sheep for a dozen years, and low-level medication is becoming increasingly popular as a preventive of strongylosis among Thoroughbreds.

Our present position, therefore, insofar as can be judged from an extensive experience, can not but be wholly supportive of the widest use of preventive phenothiazine medication against cattle parasites. The cardinal problems confronting the veterinarian are: (1) The regimen that should be recommended, (2) the possible pitfalls, and (3) the specific indications for, and possible results from, the regimen. No one can give definitive information on these points.

Regarding practical formulations, the regimen recommended for sheep, namely, 1 part of phenothiazine in 9 or 10 parts of loose salt, with grain added if necessary, has been successful in Ohio[15] and probably elsewhere. There is considerable agreement, however, that a base of mixed minerals is probably better than plain salt; in Alabama, Dr. D. A. Porter of the USDA Regional Animal Disease Laboratory used a mixture of 10 lb. of phenothiazine and 30 lb. each of salt, bonemeal, and limestone. For preliminary trial, this formulation, or one employing a base of minerals indicated in a specific area, are as satisfactory as any

that could be recommended. If the rate of consumption is inadequate, after a trial of three weeks or more despite appropriate and necessary measures to accustom the herd to the mixture, the alternatives are the employment of less concentrated free-choice mixtures, such as 1 to 15 or 1 to 20, or resort to other methods of low-level medication such as administration of the drug in feed or medicated pellets.

In general, pitfalls of the free-choice regimen in cattle, since one must assume that there will inevitably be failures, presumably could result from the same misuses that already have been noted for sheep[11]. Foremost is that no free-choice measure can succeed unless other sources of salt and minerals are precluded. Moreover, since cattle show great variation in rate of intake of free-choice phenothiazine mixtures, there must be adequate surveillance of animals, at least initially, as well as accurate information on average intake of drug per animal per day. To assure adequate intake, some producers are using a commercially-flavored brand of the chemical that is designed to be more palatable than the standard N. F. product.

Concerning what can be expected of free-choice and low-level medication, assuming that the regimen provides the correct dosage, there undoubtedly would be good control of nematodes, particularly of species already mentioned. The methods in question can not, at present, be recommended for controlling warbles, horn flies, or lungworms, since these actions of preventive phenothiazine usage have not been fully appraised. Nevertheless, whatever shall prove to be the full range of antiparasitic action of free-choice and low-level administrations of phenothiazine, these measures are eminently valuable as the most effective that so far have been developed against harmful parasites of cattle.

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Frozen Bovine Semen

Stimulating research on frozen bovine semen for artificial insemination has been undertaken by several experiment stations since preliminary reports on its use. Some results to date are that: (1) Effective insemination with frozen semen is, in general, 10% lower than with freshly diluted semen, and (2) semen from some bulls, using diluting methods now followed, will not stand freezing. Possibly new diluents will be developed or addition of optimum amounts of glycerine (glycerol) may effect improvement. Another item of interest in this regard is that some breed associations have ruled that semen (frozen) from a bull must be destroyed when the bull dies.

POULTRY PRACTICE PROBLEMS

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Treatment of Staphylococcosis in Turkey Poults

Staphylococcosis (synovitis, staphylococcal arthritis) in turkeys is a serious cause of losses in some turkey growing areas. A review of the literature has been reported by Hinshaw and McNeil (*Poultry Sci.*, 33:321, 1952) and more recently by Fahey (*Poultry Sci.*, 33:661, 1954). Although probably not as economically important, the disease does occur in chickens (Jungherr, *Jour. Am. Vet. Med. Assn.*, 98:27, 1941; Hofstad in Biester and Schwarte, 3rd ed., p. 428, 1952). The acute disease is a septicemia with later localization in the tibio-metatarsal and femoro-tibial joints, in the feet and in sternal abscesses. In young poults, the acute symptoms are those of salmonellosis. In older birds the acute stages remind one of fowl cholera. Temperatures as high as 109 F. have been recorded.

The cause is *Micrococcus pypogenes var. aureus*, but according to both Hinshaw and McNeil and Fahey, only certain variant strains seem to be capable of producing the typical disease. Hinshaw and McNeil found that strains isolated by them were generally penicillin-resistant and that penicillin-susceptible strains were not capable of producing the disease. It is also of interest that they were successful in producing the typical disease with a penicillin-resistant strain isolated from an acute case of mastitis of cattle.

Fahey found the virulent strain isolated from the outbreak reported by him to be only slightly sensitive to 10 units of penicillin and resistant to 1 and 0.5 units. The same strain was susceptible to aureomycin®[1], bacitracin, chloromycetin®[2], dihydrostreptomycin, and terramycin®[3]. On the basis of these results, terramycin appeared to be the antibiotic of choice for treatment of the disease. The use of this drug at a level of 200 gm./ton of feed for seven days was used in a group of about 350 birds 21 days of age following a single individual injection of a mixture of terramycin (2 mg.) dihydrostreptomycin (2 mg.) and potassium penicillin (10,000 units) in a 0.2 ml. inoculum. Within three days following treatment, the general condition and appetite of the birds began to improve. By the end of one week, practically all signs of lameness had disappeared, and in two weeks all evidence had disappeared. Three months after treatment there had been no recurrence and the total mortality for three months was 2.1% as contrasted to 17.3% in 11 days previous to treatment. Fahey's report is important especially because it is the first evidence, to my knowledge, of successful treatment of this disease. To insure that the correct antibiotic is used in an outbreak, a laboratory assay of the strain of *M. pyogenes* could be made prior to treatment to determine its sensitvity.

®[1]Lederle Laboratories Division, Pearl River, N. Y.
®[2]Parke Davis & Co., Detroit, Mich.
®[3]Chas. Pfizer & Co., Brooklyn, N. Y.

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Recent Bulletins on Poultry Problems

Below are listed titles of recent bulletins that contain information of interest to veterinarians.

1. Sexing Baby Chicks by Shrader, Burroughs and Hammond, published by American Hatchery News, Kansas City, Mo., is available for 25c per copy. It contains a detailed illustrative description of the technic for sexing baby chicks.

2. Coccidiosis of the Domestic Fowl by Henderson, Purdue University Agricultural Extension bulletin 397. May be obtained from Purdue Univ., Agricultural Extension Service, Lafayette, Ind.

3. Ornamental and Game Breeds of Chickens. USDA Farmers Bul. 2066. The title is self explanatory and is a well illustrated description of these breeds.

4. Marketing Eggs, USDA Farmers' Bul. 1378, is a detailed description of the problems concerned with the marketing of eggs. It contains selected references and a list of available motion pictures related to the subject.

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It is estimated that the adult, normal fowl has approximately 8,000 feathers.

ABSTRACTS OF LITERATURE

Antibiotics in Poultry Feed

The value of antibiotics has been well established by nutritional research data. These agents have been acclaimed as the most significant factors in increased gains and improved feed utilization in poultry production[4].

The recommended level of penicillin, the most consistent of growth-stimulating antibiotics, is 2 to 5 gm. per ton of feed. Other antibiotics require various qualities for full activity. Their addition increases feed cost from 70 cents to $1. per ton, easily offset by better growth and weight at market age and less feed required for pound of gain.

Health considerations are admittedly the biggest problem confronting the broiler producer. A good appetite is likely to assure and maintain good health and low-level antibiotic feeding has been demonstrated to be helpful in realizing profitable gains from broiler feeding.

High-level antibiotic feeding has less to justify its use to prevent, alleviate, or control specific disease. However, poultrymen are convinced that treatment of large numbers of birds is most practical through medicated feeds. Thus, feed manufacturers have been forced to serve as dispensing pharmacists even in the absence of experimental evidence of the value of such medication. Waste of drugs, if not actual harm has resulted from too common or promiscuous employment of high-level feeding.

If treatment is to produce favorable results, accurate diagnosis is essential. This is within the field of veterinary practice and, where practitioners are disinterested or indifferent, poultrymen turn to other facilities that might be available. Use of antibiotics, under professional supervision or prescription, in feed or water for treatment of disease is economically feasible or combinations are fed without a thorough investigation of the disease outbreak or pathology.

Other factors suggest caution in the use of any type of medicated feed. Not the least of dangers is the tendency to rely upon disease-prevention powers of drugs at the expense of sound management practices.

[4]Klussendorf, R. C., Antibiotics in Poultry Feed and Water—Use and Misuse. *Jour. Am. Vet. Med. Assn.*, 125:155 (Aug.), 1954.

New Feeding Program Suppresses Parasites, Boosts Cattle Profits

A treatment that boosts beef production through reducing the drag of internal parasites, such as stomach worms, in an apparently healthy herd has been reported by agricultural investigators of the Du Pont Company, following two years of practical field tests with more than 600 steers on the Welder-McCan Ranch[5] in Woodsboro, Texas.

Based on the addition of small amounts (0.5 lb.) of phenothiazine to their cottonseed meal supplement, (99.5 lb.) the treatment saved 30% of the feed bill for concentrates, per pound of gain chalked up by the cattle. The phenothiazine-cottonseed meal was blended with granulated salt at various levels so that intake of CSM was maintained at 1 lb. per head per day.

Most remarkable, parasite eggs were reduced greatly in droppings from treated cattle, and most of those that were shed failed to hatch. In this was indication that continued treatment eventually may remove hazards that lurk in pastures as sources of parasitic infection. During a 56-day observation period, phenothiazine-fed steers contaminated their pastures with only 1/40th as many parasitic ova as were shed by untreated steers. The 74 lb. of phenothiazine fed to 202 animals during this period did away with more than 200,000,000,000 stomach worms, it was estimated from laboratory examinations conducted by Texas A. & M. College in cooperation with the Du Pont researchers.

While these effects from small amounts of phenothiazine in cattle feed had been shown in laboratory experiments, this was the first time that large scale tests with a herd under typical ranch conditions had been undertaken. The better gains recorded by steers receiving the low-level phenothiazine treatment indicate that control of internal parasites, even in animals that appear perfectly healthy, may lead to profits in the cattle business never before realized.

[5]Boughton, D. C., and Bacon, R. J., Phenothiazine in the Control of Internal Parasites of Beef Cattle: Economic Advantages Demonstrated in Field Studies. Mimeo Bul. Du Pont Product Information Service, December 1954.

Pulmonary Emphysema of Cattle

The Wyoming Veterinary Medical Association has prepared information on pulmonary emphysema of range cattle that represents a symposium on the subject by six veterinarians. The bulletin has been made available as a report of local disease problems of beef cattle under the mangement practices on the northern ranges[6].

Symptoms, as observed in Wyoming, are usually all of an acute nature. Some affected animals die so suddently that no symptoms are noticed. Depression, dyspnea, grunting, coughing, and death within 72 hours from anoxia characterize the acute syndrome. Dr. Robert E. Pierson raised the question of the significance of sand and gravel found in the stomachs at autopsy. He states that wet cows usually are affected during the fall season and the disease is most prevalent during drought conditions.

Definite cause has not been determined. Suggested theories included imbalance of mineral intake, allergy to unstable vegetative foodstuffs present in certain range plants, sensitization to molds, or other organisms, and toxins produced by *Clostridium perfringens* (type D) present in the digestive tract.

Typical postmortem lesions primarily involve the lungs. Microscopically, extreme emphysema and edema are observed. Animals bloat and decompose rapidly, mucous membranes are cyanotic, and blood oozes from nose and rectum. Microscopically, emphysema is not always the predominant change as seen by the laboratory technician. Alveoli are filled with edematous fluid and interlobular septa are distended by edema. Dr. J. F. Ryff states that the emphysema is probably secondary to the edema.

Treatment in advanced cases has proved futile. In mild cases antihistamines, adrenalin, and mineral oil appear to be beneficial. The mineral oil is given on the theory that the oil absorbs toxins in the rumen. Improved management practices are recommended, including provision of a hay fill before animals are allowed on pastures or meadows.

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One case of eggs will make about 37 lb. of frozen whole eggs. It takes about 38 eggs to make 1 lb. of dried eggs.—*Wallace Farmer, Sept. 4, 1954.*

[6]Pulmonary Emphysema of Cattle, a publication of the Wyoming Veterinary Medical Association. Dr. J. F. Ryff, Laramie, secretary-teasurer, 1954.

Changing Reflex Action of the Gullet in Ruminants

Guiding feed and medicaments to the paunch or true stomach depends on the animal's age[7].

In newborn calves, milk and water normally enter the abomasum; after a few weeks of age, water, as a rule, goes into the paunch, but the milk continues to go into the abomasum through a reflex action of the gullet. This reflex is caused by the taste of milk. Other liquids cause the same reflex action as milk — for instance, blood, blood serum, and certain medicaments, such as solutions of sodium bicarbonate, sodium sulfate, and sodium chloride.

When young calves drink too rapidly, milk goes into the paunch and causes severe indigestion. During the weaning period, solid feedstuffs go into the paunch, but the milk does not; therefore, drinking water must be available to avoid drying out of paunch content.

The reflex of the gullet completely disappears when cattle reach the age of four years. Thus, in mature ruminants, solid and liquid feedstuffs go first to the paunch and the reticulum. Only if the animal is thirsty does water go directly into the abomasum, and this may cause indigestion.

The physiological conditions outlined play an important role in the oral administration of drugs to ruminants of the different age groups. Some drugs, such as the sulfonamides, are more effective when they reach the abomasum first, while others, such as the antiferments, are more effective when they reach the paunch first.

In order to get drugs into the abomasum of animals under two years of age, they should be mixed with milk or the animal should be given some milk before administering the medication; also, mineral solutions, such as 1% sodium chloride solution or 5% copper sulfate solution, are indicated.

It is more difficult to stimulate the reflex in older animals. For them, a saturated sodium bicarbonate solution or a 5% copper sulfate solution is recommended, or drinking water may be withheld for a period before treatment. This is especially useful in the treatment of cattle for the removal of worms from the gastrointestinal tract.

On the other hand, to get medication into the paunch first, especially of older animals, the use of a nasal tube or trocar is indicated. —*R. Seiden.*

[7]Brunaud, M., Die Passage von Nahrung und Medikamenten im Wiederkaeuermagen. *Die Veterinaermed,* 5: 443, 1953. *Rev. Med. Vet.* 103: 543, 1952.

BOOK REVIEWS

Books reviewed in this department and any other books, if available, may be obtained by remitting the published price to the Book Department, Veterinary Medicine, Suite 803 Livestock Exchange Building, Kansas City 2, Missouri.

INDEX OF TREATMENT, SMALL ANIMAL PRACTICE by *Hamilton Kirk, M. R. C. V. S.*, London, England, 3rd ed., 888 pages, 194 illustrations. Williams and Wilkins, Baltimore, Md., publishers, 1954. —Price $11.

The author of this popular textbook on the treatment of pet animals stated in the preface to the first edition that he had attempted to produce a handy guide to the therapeutic treatment of diseases common to this class of animals. Attest to the success of the book is in the fact that reprintings and a third edition within six years have been required to keep up with the demand for copies. It has as a companion, the well-known Index of Diagnosis. Both have enjoyed wide circulation both in Great Britian and the entire English-speaking world.

This, as the other editions of Index of Treatment, is divided into three parts. Part I is essentially materia medica. New chapters containing new material appear on hormone and vitamin therapy, antiseptics, antibiotics, anesthetics, and antihistamines. A tabulation of hormone preparations also should prove useful. Products are grouped according to classification and generic designation. Specific preparations are listed with administration route and strength per unit.

Part II makes up the bulk of the text. In this portion aberrations common to small animals are treated under an alphabetical arrangement. In addition to recommendations for treatment under a variety of conditions, discussions frequently include symptoms observed, etiology, and pathological processes. Cross-indexing assists the reader to the proper discussions and references are appended for those interested in more detailed considerations. The book's popularity is due to the technics contained in this section to outline treatment regimen the clinician can grasp at a glance.

Part III is devoted to general information including chapters on handling and restraint, nursing, feeding, et cetera. Illustrative material is weak, by standards of the best medical textbooks produced here, and consists largely of much-used cuts lacking freshness of the text material.

Index of Treatment (3rd edition) is enlarged considerably by virtue of rewriting much of the text to include fresh and new information on many diseases made available since 1951, and a separate section on antibiotics. There also have been appended enlarged posological and general information tables and a new listing of proprietary preparations and manufacturers, alphabetically arranged with names and addresses of manufacturers or distributors. This list, with the explanatory note of contents of proprietary frequently given when the brand-named agent is mentioned, adds value and in a measure answers the criticism of some reviewers of previous editions that agents referred to were unknown and unavailable. In many instances the authors list prescriptions in the traditional style, often several of them, designating medicinal treatment in several forms or varieties. A large and comprehensive index also is appended. Paper stock is of considerably higher quality than that used for previous editions.

Index of Treatment is quite likely to continue to be popular because of the brief, crisp style of presentation and lack of all embezzlement.

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FERTILIZATION IN CATTLE: A MANUAL FOR VETERINARY PRACTICE, (Trans. title) by *Prof. Dr. Diedrich Küst* and *Dr. Franz Schaetz*. 149 pages, 47 illustrations. Ferdinand Enke, Verlag, Stuttgart, Germany, publishers, 1954.

The authors discuss briefly the history of artificial insemination from the 18th century, and the great increase in the use of this method since the first World War.

The anatomy and physiology of the reproductive organs of the cow and bull are adequately described. This is followed by discussions of the methods used in artificial insemination. Harvesting the sperm, use of artificial vagina and the phantom, preservation of the sperm, methods of insemination, and use of the speculum and insemination tube.

This concise outline of information concerning artificial insemination should prove useful to all veterinarians interested in cattle practice who read German.—*Joseph P. Scott, D.V.M.*

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ITEMS OF VETERINARY INTEREST

Wild rats are suspected as possible spreaders of vesicular diseases.

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Some swine breeders recommend destruction of all pigs weighing less than 1½ lb. at birth.

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Eradication of bluetongue in sheep is not considered feasible. Vaccination is claimed as the most reliable control measure.

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Nature imposes exact and specific requirements for life processes. These include not only food element but environmental factors.

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World milk production, including amounts used for butter production, is sufficient for only one quart of whole milk every three days for the world's population.—*S.N.L. Nov. 27, 1954.*

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Benefits derived from routine cud inoculation of calves is debatable. The practice should be avoided if disease transmission hazards outweigh potential gain in growth and weight.

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The whipworm of man (*Trichuris trichiura*) is a separate species from the whipworm common in dogs. The latter is not infectious for man.

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Safety of the Salk poliomyelitis vaccine appears to be assured but until results of recent immunization trials are announced by the Francis Committee, it will not be known if this vaccine is one answer to the problem of crippling poliomyelitis. It is expected that compilation of results will be available about April 1, 1955.

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Action of Antibiotics

The belief held in the past that antibiotics in the feed of animals caused increased, over normal, gains because of holding down digestive tract microorganisms no longer seems tenable. Recent evidence is that the increased gains from the addition of the antibiotics is because of their depressant action on the thyroid gland, thus influencing metabolism.

Suckling calves nursing infected cows are spreaders of brucellosis.

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One must utilize all available knowledge of nutrition of meat animals to feed them profitably.

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Human Rabies

Three cases of human rabies are reported by Erickson *et al.* in which patients presented bizarre symptoms suggesting nervous system involvement and respiratory lesions. In none was the clinical diagnosis of rabies made but histories of bite wounds were eventually elicited.

Necropsy findings in each of these cases revealed lung changes interpreted as focal pneumonia. Lungs were edematous and when examined microscopically, air spaces were noted to contain a homogeneous coagulum and neutrophilic granulocytes.

Contained in this report* are statistical details from the records of the Texas State Department of Health. During the calendar year 1953 the following examinations for rabies were made:

Dogs	2,989	1,075 positive
Cats	859	68 positive
Cows	178	58 positive
Foxes	171	150 positive
Skunks	68	44 positive
Raccoons	17	2 positive
Coyotes	6	1 positive
Wolves	3	3 positive
Goats	7	3 positive
Bobcat	1	1 positive
Horses	3	1 positive

In all, 4,302 animals were examined for rabies; 1,406 were found to be positive for Negri bodies. This Department also recorded 34 cases of human rabies during the 11-year period 1938 to 1948.

*Erickson, Ethel E., Marcuse, Peter M., Halpert, Bela, Human Rabies: A Report of Three Cases. *Jour. Am. Med. Assn.*, 155:823 (June 26), 1954.

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